ESSAYS

ON

THE CHANGES OF

THE HUMAN BODY,

AT ITS

DIFFERENT AGES;

THE

DISEASES

TO WHICH IT IS PREDISPOSED IN EACH PERIOD OF LIFE;

AND THE

PHYSIOLOGICAL PRINCIPLES

OF ITS

LONGEVITY.

THE WHOLE ILLUSTRATED BY

MANY ANALOGIES IN PLANTS AND ANIMALS.

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LONDON:

PRINTED FOR LONGMAN, HURST, REES, ORME, AND BROWN, PATERNOSTER-ROW.

1811.

J. G. Barnard, Printer, 57, Skinner Street, London.

TO

MATTHEW BAILLIE, M. D.

F. R. S. OF LONDON AND EDINBURGH;

AND

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS,

IN LONDON,

SUPER-EMINENTLY DISTINGUISHED IN THE PROFESSION,

AND EQUALLY SO BY HIS WRITINGS ON SUBJECTS

RELATING TO IT,

THESE ESSAYS

ARE RESPECTFULLY SUBSCRIBED,

BY HIS FRIEND

AND HUMBLE SERVANT,

THOMAS JAMESON.

PREFACE.

THE brilliant discoveries of modern chemistry, by opening a new page in the volume of nature, have engaged the attention of medical men so completely, that publications on physiological subjects have become extremely rare. The distinguishing superiority, however, among the faculty, does not consist so much in chemical skill, as it does in a knowledge of the laws of life, and in an accurate discrimination of the causes and seats of diseases, since the mistaken judgment of a disorder must always be followed by an improper application of remedies, however valuable their properties may be. This treatise will, therefore, derive some degree of importance from promulgating a knowledge of the

human body, which constitutes the basis of medical practice, and, at the same time, must prove more or less interesting to all men, as it embraces the general history of their health, and consequently of their greatest happiness.

The advantages of modern physicians over their predecessors, proceed less from an enlarged observation of the phenomena of nature, than from a more minute attention to particular objects, and to the structure of the body both in its natural and diseased states. And these have been the means of reflecting new lights on some parts of the animal economy, imperfectly known to the ancients, and have led to the discovery of many morbid affections, that were entirely concealed from their careful scrutiny.

Hence too, it has been ascertained that the changes taking place in the human body, together with most of the diseases which invade it, are of an organical na-

ture, and that morbid symptoms cannot prevail any great length of time, without producing an alteration in the structure of the organs, although it frequently may be so minute as to elude superficial observation. Nay, it has been matter of reasonable doubt with some authors, whether or not there are any other kinds of diseases, than those which depend upon disorganization of particular parts of the body. It will appear from the numerous instances in this treatise, that the disorders deemed truly constitutional, the influence of which extends to every part of the system, such as rickets, scrofula, inflammations, &c. may be traced to a local origin; and we know that even spasmodic diseases occasion latent changes in the state of the living fibre, since they produce a tendency to recurrence, in the same places they formerly occupied, and hence denote a morbid disposition of parts, from some permanent cause.

But among the many volumes written upon physiology, the author has met with

no modern one, that fully enters into the general changes which the structure of the body undergoes by age, and disease. This deficiency has induced him to commence an inquiry into the nature of its progressive evolutions, in the regular order of their occurrence. The assistance derived from Baron Haller's Physiology, and other books on anatomy, as well as from the systematic works of the ancients, and the authenticated facts of the moderns, respecting the changes of age, led him to the other considerations of the treatise, concerning the manner in which diseases arise out of the natural changes of the body, and the specific degrees of longevity which attach to each period of life.

The subject of the *first Essay* in this volume, may be stated in the following appropriate words of a celebrated physiologist: "Why the same kind of food which "enlarges and invigorates the body, from "infancy to the meridian of life, and then "nourishes it for some years unimpaired,

"should at length gradually cease to do so, "and the debility of age and death super- "vene, would be liable to surprise us, if "we were not in the daily habit of observ- "ing it, and is a circumstance which has "not yet been well understood*."

The *second* Essay, arising out of the consideration of human growth and decay, will shew that the changes of age produce certain conditions of the organs, which render the body liable to distinct and appropriate classes of diseases, in the different periods of life. The obscure changes gradually operating in every part of the system, from the beginning to the end of life, is matter of general experience. Most persons attempt to tell the ages of others, from the appearances of their features, the look of their eyes, or even the form and size of distant parts of their bodies; and the anatomist can demonstrate them from internal structure more certainly; but how these na-

* Dr. Darwin's Temple of Nature. Canto II. line 3.

tural changes become the predisposing causes of disease, is a subject as little attended to, as the former. If the author, therefore, should not be able to add much to the advancement of science, he will, at least draw the attention of his readers to subjects but little explored. He had some hesitation respecting this part of the subject. The book is written chiefly for the perusal of medical men, but as it is likely also to fall into the hands of other literary persons, who are curious on the subjects of age and longevity, he at length determined to use the English names of diseases, as often as possible, and to explain their history, by language as familiar as propriety and the nature of the subjects would admit, in order to render the work more generally useful.

The *third* Essay of the volume, which respects the principles of longevity, is of so intricate a nature, from the uncertainty appointed by Divine Wisdom to the life of man, that writers have hitherto advanced

little further than the discovery of one leading feature, the hereditary appearance of longevity. No subject has been more written upon, as far as respects the operation of external causes; but few writers have attempted to ascertain its laws upon physiological principles. The author has therefore attempted, from the histories of the natural and predisposed states of the body, to make some general deductions concerning vital duration, accompanied also with a few observations on prophylactic, which have arisen out of the consideration of the preceding subjects. It will be generally acknowledged, that to ascertain the causes of the premature mortality of human beings, and its prophylactic at the different ages, is a consideration of the highest importance, in as much as prevention is always preferable to the cure of diseases: and it is equally certain, that these objects can be much better attained, by promulgating a knowledge of the human frame, in its different situations, than by any particular rules of diet, or precepts for longevity, that can be laid

down, since no plan of regimen can apply, like a quack remedy, to the diversities of age, sex, temperament, climate, and habits of mankind.

As the general purpose of a preface is, to state the reasons for publication, as well as to give an explanation of the work itself, it may not be inexpedient upon this occasion to acquaint the reader, that the attention of the author was first directed to the subject in the year 1793, when he delivered an annual oration before the Medical Society of London, on the progressive changes of the body. The general approbation of the members at that time, encouraged him to continue his researches, until they might assume a form for public inspection.

Although the undertaking has not ceased in some degree to occupy his mind ever since, he is sensible that, even in its present state, it will expose him to the severest criticism, not so much on account of the difficulty that naturally attends the distinct

arrangement of a multifarious and complicated subject, as from the necessity that occurred, of deciding upon many abstruse and contested opinions of physiology. No doubt, the constant application of forty-four years to the science of medicine, must indicate a life sufficiently long to entitle the author to form some judgment of the changes of the body by age, from personal experience, although it may scarcely be sufficient to enable him to specify the years in which the various diseases usually take place, with that degree of accuracy which is always desirable. But he hopes his brother practitioners, who have had superior opportunities of knowledge, will excuse the attempt from his own observation, which must of course, on some occasions, vary considerably from theirs. He will not however regret having written an imperfect book, if it should, only, by new arrangement, serve to impress upon the reader's mind a few of the many important facts which it contains.

From investigating the changes of the human body, he was led to consider similar mutations in the other kingdom of animated nature: a subject which involves still greater difficulties than the former, notwithstanding the glimmering lights thrown upon it by some late authors; but as he perceived in the course of his inquiries, that even slight comparisons of nature with herself, might be employed to illustrate some of the phenomena of human life, he has introduced the general analogies of the economy of animal and vegetable bodies, in the form of notes; which are sufficient to show, that the living principle governs both kingdoms by similar laws; that the ascending scale of organization, and of living powers, from the lowest tribes of vegetable bodies to the exalted state of human structure, proceeds in regular gradation; and that the progressive changes among inferior beings, display a beautiful, although a distant, resemblance, to those of human organization. In short, he conceives, that the knowledge of the means which nature

employs for the increase and decrease of life and strength, is of so much importance to mankind, that an omission of research into any real sources of information, in this part of physiology, would be considered as inexcusable.

Although it is well known, that the prosecution of minute experiment is the surest means to improve science, yet it is not less true, that simple facts are of little value to mankind, unless they be brought into comparative view, and this has been a chief object of the Author throughout the work.

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INTRODUCTORY OBSERVATIONS

ON THE PHENOMENA OF

LIFE AND GROWTH.

THE appropriate number of organized beings every where existing on the surface of the globe, and the various means by which the equilibrium is preserved, must excite the admiration of every reflecting mind. But the diversity of organs and faculties possessed by the different species, which enables them to live together in all situations, and to contribute to the support of each other, are not more wonderful, than the changes their bodies respectively undergo by growth, for the purposes of perpetual succession. It is these changes which are to become the subject of this enquiry.

Organic bodies are readily distinguished from all others, as they consist of matters arranged by the laws of life, which possess internal powers of nutrition and reproduction, the one to preserve the individual, the other the species. To increase, propagate, decrease, and disappear, is the great law which regulates the succession of individuals in the organic world, and by modes so very analogous, that the physiology of one class of beings, serves to illustrate that of the other.

But the boundaries of the organic kingdoms are marked by such invisible shades of gradation, that it has always been found extremely difficult to draw the respective lines of distinction, for there is a much greater difference between some classes of the animal kingdom, than there is between an animal and a vegetable, since the chasm in the scale of beings, is more conspicuous between a quadruped and the human species, than between the moving plant of Bengal, and the animal flower of Barbadoes. They, however, differ from each other much more in the structure of their bodies, than in the general laws of their economy.

To define their elementary principles by analysis, affords no criterion of distinction, since cruciform plants yield ammonia, as well as ani-

mal substances. Plants, however, are by far the simplest bodies, for their anatomy is similar in every species, and nearly the same in all their parts, above and below ground. They are chiefly composed of assemblages of minute vessels, connected together by cellular texture, which perform the functions of alimentary canal, arteries, lungs, absorbents, and secretory organs; but most of them are compound bodies, containing germs in every part of their surfaces, of the same simple structure with the parent plant, by which means they are distinguished for astonishing powers of reproduction.

Some of the lowest orders of animals have less distinction of parts, than the tribes of vegetable bodies. We can discover no fibres in the lump of jelly, which composes the polype, a digestive sac, and rows of tentacles that supply it with food, being all the organs we can perceive. Indeed the only structures always occurring in the animal kingdom, are an external mouth, and an internal stomach, intended, no doubt, for the nourishment of beings which exist in an independent and moveable state*.

* Movement is the first sensible sign of animal life, but it would appear from the perfection of many parts of monstrous

But the functions of animals, unlike those of vegetables, are performed in an infinite variety of ways, for in nothing is the fertility and luxuriance of nature more remarkable, than in the

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productions, without a head or heart, that the medullary matter of nerves is originally blended with animal structure. This is rendered still more probable, from observing the design attached to the movements of the simplest animals, even without fibrous organization, for which purpose we have selected the following instances.

After much discussion and controversy, Mr. Ellis has plainly shewn, that *Coralines* and other Zoophites are true animals, without possessing any vegetable properties. He has also proved, that the *Actinia sociata,* or clustered animal flower, found at Barbadoes, and on the coast of England, possesses tentacles disposed in regular circles of various colours, like the petals of a beautiful flower; but, unlike a plant, they alter their shape, and send forth branches in search of food, from a creeping root, which moves slowly, and attaches itself to rocks. Each of these branches has a mouth which swallows large muscles and crab-fish, digests them, returns the non-nutrient parts by the same opening, and retracts to a gelatinous form when danger approaches. Nay, he says, he discovered a stomach, muscles, and tendons, on dissecting these animals, which were before considered as vegetables. Phil. Trans. abr. vol. xii. p. 468.

Among the animals which connect the kingdoms, none has been so much attended to as the *Hydra,* or freshwater polype. And it is well known, that in its contracted state, it resembles a greenish lump of jelly, but extends its body an

difference of organs conceived for nutrition, in the various species of animals, and for their

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inch or two, sends forth arms to seize insects larger than itself, and swallows them, with great voracity, by a mouth situated in the centre of its body. The lives of the gelatinous animals without eyes, are preserved by their excessive irritability. The polype is even said to be affected by the rays of light; and when it is cut in pieces, the most minute subdivisions of its body become new animals, as complete as the old one. *Hydatids*, vesicular bodies, inhabiting the viscera of large animals, consist merely of a stomach, and have little or no motion to characterize sensation, because of their confinement, and want of independent existence. But other kinds of parasitical hydatids possess rows of tentacles, with which they voluntarily attach themselves to various animals, for supplies of food.

The *Molusca*, or naked sea worms, possess mouths and consequently sensations from a stomach, and the retractile tentacles which surround their mouths, serve them for feet as well as hands. The *Medusa*, or sea nettle, a gelatinous body, which floats on the ocean, assumes a luminous appearance, changes its form, and conveys small fish to its mouth by rows of tentacles. Among the Testacea, the *Oyster* remarked for its torpor, evidently possesses muscular fibres, with which it opens the shell to take food, and shuts it afterwards. The author has seen these animals attach themselves to the bottoms of uncoppered ships, in the harbour of New York in America, and adhere to them during a fortnight's voyage to the West Indies. No doubt their ova floating in the water may readily fix themselves to the

different economies in air, land, and water *.

No character distinguishes the kingdoms so completely as that of sensation, which renders

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bottom of the vessel, but it is difficult to conceive how their adhesion resists the force of the waves such a length of time. Nothing is more remarkable than the activity of Infusoria animalcules, inhabiting stagnant waters. The *Vorticella*, or wheel-animal, keeps the water in a constant state of agitation with the rotatory motions of its cilia, which is the means it employs to draw its food towards it. Mr. Baker ascertained the various changes it undergoes in form, by the microscope; and describes the seat of the brain, the motion of the heart, and the circulation of the blood, in this minute animalcule.

* The gradation of organs, and the varieties of structure performing the same functions, is peculiarly evident in the breathing organs of animals, which are adapted to their modes of immediate existence in the different elements. The more capacious the respiratory organs, the greater the heat and activity of the animal. *Insects* and *Worms*, which breathe by pores on their surfaces and tracheal tubes, receive only a small portion of air, and possess heat scarcely greater than their surrounding element. *Fishes*, which breathe by gills, are two or three degrees warmer than their medium. *Amphibia*, which breathe by lungs, have a standard heat five or six degrees above that of their water, and possess a voluntary power of augmenting it in their different elements. And *Birds*, which breathe by cells universally diffused over their bodies, communicating even with their hollowbones, are the hottest of all classes of animals, and have the greatest muscular actions.

animals percipient beings, and consequently includes their voluntary locomotion, to make that principle safe and useful. Whereas, all plants are deprived of nervous sensation, and voluntary locomotion, intended, no doubt, to prevent them withdrawing themselves from the support of animals: this constitutes the difference of life in the two kingdoms.

An unexceptionable *Definition of life,* cannot be given, as it is only known by its complicated effects; and we must confess, that the *Living principle,* which retains the particles of the vegetable seed, and the organization of the egg, entire, in opposition to chemical and mechanical laws, and produces all the activity, and beautiful diversity of animated nature, is an invisible agent, of which we can form no competent idea; but Physiologists have accurately distinguished the particular properties of living matter, by the names of irritability and sinsibility*.

Irritability, a general property of living matter, is considered as the source of all the phe-

* The consideration of soul the author leaves to divines, and has only to observe, that he is sensible of something existing within him, independent of the matter of the body, which will exist after its dissolution.

nomena of plants, excluded from the possession of a nervous system, and may be distinctly seen in the operation of external causes, upon the exquisite contractility of the foot-stalks of their leaves, and parts of fructification*. In

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* The motions of plants approaching nearest to those of animals, are the following. Many *Creeping plants* detach shoots from their advanced stems, which spring up several feet distant from the parent plant; but this is a species of locomotion unconnected with volition. The *Helianthus*, or sun flowers, turn to the grand luminary in his progress from rising to setting, in consequence of the stimulus of heat and light. And they also open and shut their leaves, at stated hours, from a similar condition of the atmosphere. The *Mimosa sensitiva*, or sensitive plants, drop their leaves upon being touched, and they soon afterwards recover their former situation. The *Dionea muscipula*, or Venus's fly trap, closes its prickly leaves, when touched by a fly, and keeps them shut until the insect becomes quiet. But the most wonderful instance of irritability, is observable in the *Hedysarum* or moving plant of Bengal, which approaches and recedes its ternated leaves without ceasing, as well in the dark as in the light. All these motions are as distinctly the effects of mechanical impulse, as the expulsion of the pollen by moisture, its transportation by the wind, and the bursting of the pod by heat.

But it is a much more difficult problem, to explain the nature of the principles which determine plants to act in a way, only, that is most conducive to their own preservation, and so greatly resembling the instinctive impulses of the

animals, this contractile power prevails most abundantly in the fibrous structure, but not exclusively, for it is found in most parts of their bodies, and predominates in the inferior,

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animal kingdom. Thus the propensity of the root to descend in the earth, and the duck to dive in the water, the stem to ascend perpendicularly in the atmosphere, and the eagle to soar in the air, are not less invariable and uniform actions in one kingdom than the other. So little do some of the movements of plants depend upon external circumstances, that the husbandman is never solicitous how he sows the seed, as he is certain that when it germinates, the root will infallibly strike downwards, and the stem will rise upwards. Nay, some plants are known to extend their roots to considerable distances in poor soils, while others overcome obstacles of the greatest magnitude, to arrive at a scanty supply of food, in a wonderful manner.

But the law of the ascending stem is not so uniform as that of the descending root, since many plants deviate from it, when their existence is at stake, and grow in a lateral direction, to arrive at the pure streams of air and light; nay, some stems will grow downwards to imbibe these celestial fluids. The *Ivy*, for instance, and many other scandent plants, advance their stems several yards in one season, and escape out of doors and windows of buildings: nay, they will divide their branches, that they may take possession of both openings. The *Hop* and *Honeysuckle* will seize a pole any where near them, and ascend on it spirally, as if they knew from geometrical principles, that it was the best method of rising on a weak body: and when they are

more than in superior animals, possessed of a complete nervous system.

Nervous sensibility exists in every species of animal, for although many zoophites exhibit no appearances of nervous fibres, yet nervous matter is diffused over their system, which may be understood, from irritability being generally allowed to animals, wherein no muscular fibres can be traced. Certainly, the sense of taste and touch are wanting in no animal: and the lowest tribes exhibit signs of design and action, when their appetites require gratification. Even the micriscopic, the most insignificant animals of creation, are discovered moving rapidly in fluids, without interfering with each other.

It appears that living bodies exist in three different states. *Vegetable life*, depending upon the irritable principle, which causes the contraction of matter, and gives a peculiar action to the different organs. *Sensitive life*, arising from the addition of sensibility to the irritable power, which is discovered in invertebral animals, by expressions of desire and pain. And *Cere-*

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completely obstructed, will descend again in a streight line, to render their progress more speedy: thus demonstrating movements in consequence of a living principle, which we cannot explain.

bral life, where impressions are transmitted to a common sensorium, the source of ideas and thought, as is discovered in vertebral animals.

A nervous system is, therefore, not only the boundary of the kingdoms, but constitutes the distinguishing character of the different classes of animals, for whenever they possess a spinal marrow and brain, the number of their senses are greatly augmented; and in proportion to the distinct form of their brain, and its relative magnitude to the nerves of the external senses, so is their importance further advanced in the scale of creation. This is the chief reason, that *Man* is so greatly exalted above all other animals. His intellectual powers, from the size and structure of the brain; his discriminating ideas, from the sense of touch; his pre-eminence of power, from the endowment of hands; and above all, the divine gift of speech, for the communication of sentiment, constitute him the lord and governor of the creation.

Growth is another general property of living matter, stated by some authors to be a principle entirely different from the former ones, and they have accordingly, called the power which produces and preserves the original form of plants

and animals, *Nisus formativus**. Growth, like irritability, exists in animals after their nerves are divided; but it does not, in all things correspond exactly with the laws of irritability in either kingdom; since it is found in every kind of living structure nearly the same, and ceases to exist when bodies arrive at the determined size of their species. We, however, observe, that it is intimately connected with the irritable principle; since simple organic bodies, especially those which are young, possess the greatest share of irritability, and grow faster than older ones, or those of more complex structure. We also find the simplest bodies have the greatest share of renovating principle.

But the unity of purpose among living powers, during the process of nutrition, and the consentaneous actions of every part of a living system, to accomplish its growth, depend on principles of life so very obscure, that the author will only endeavour to trace a few of its most conspicuous phenomena in a human body.

I. The stimulus of growth produces a quick circulation of nutritious fluid over the system, intended, no doubt, for a speedy supply of arterial blood, containing new matter, to enlarge the size of parts. It is chiefly for this reason, we

* Blumenbach on Generation, translated by Dr. Crichton.

find, that the force of growth corresponds to the celerity of the pulse, before the meridian of life, that young people encrease their stature with greatest rapidity during fevers, and that granulations cease to grow in wounds, when their circulation becomes languid.

II. The consent of the system is observable in the specific action of the capillary arteries, taking place in every part of the human body, accompanied at the same time with a strong disposition to extend their extremities, in the growing period of life. That the growth of the body cannot depend upon the distending power of the heart and large arteries, as two of the most illustrious authors, Haller and Cullen, have supposed, is obvious, from the similarity of its laws in animals without a heart. On the contrary we must, with Mr. John Hunter, consider it as depending upon the number and condition of the capillary arteries*, which appears to be the case in every species of living creature whatever. We therefore find its energy greatest in their extreme parts, and at their most irritable ages.

The greater abundance of capillaries occasions

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* The Posthumous works of Mr. Hunter, on the uniting medium.

the circumference of organs, in which, also, the juices are generally most copious, to grow faster than their central parts; thus the long bones grow more at their soft extremities than at their hard centres, which retain nearly the same position at all times; and neither the skin of the body, nor the investing membranes of the organs, become over-distended by the healthy increase of parts beneath them. In like manner, the body grows with greater rapidity in the fœtal state, than at any other period; the capillary arteries being ten times more numerous at that age, in relation to the size of the system, and the nutritive juices being much more abundant, than in adult years.

III. The consent of the system is observable, in the deposition of matter taking place from the extremities of the blood-vessels, to enlarge the size of the body; while, at the same time, the absorbents, by removing many of the deposited particles, produce a gradual induration of its substance, and prevent the parts from assuming a preternatural direction. The minute extremity of every capillary artery of the body, becomes, in this way, a secretory organ, to assimilate part of the vital fluid to its own nature, in a manner not very different, from that which takes place in a wound with loss of substance.

When gluten is deposited from the extremities of the divided arteries of a wound, new vessels begin to form in it, and the old ones elongate their extremities, not by mechanical distension of the capillary arteries, but by a deposit of new matter on their surfaces. This deposit becomes a living solid of similar structure with the old parts, by the assistance of absorbent vessels only.

We cannot suppose the growth of supernumerary parts, the renewal of the lobster's claws, or the formation of new polypes, from the minute subdivisions of the old one, to depend upon the distension of preexisting stamina. On the contrary, such phenomena can arise from no other cause, than a secretory process of living vessels, which deposit new matter, possessed of the same intrinsic properties, as those of the old parts, from whence it was deposited.

We distinctly observe the nature of growth, in the cylindrical bones of superior animals; while they are gradually elongated by continued deposits of cartilaginous matters at their ends, their centres are hardened by concentric lamina of calcareous phosphate, uniting firmly to each other; and shells, the skeletons of inferior animals, are formed in the same way. Layers of indurating matter succeed each other, every

new layer extending beyond the edge of the former, their circumference and thickness are increased at the same time; and those modes of growth, are not unlike the annual formation of rings in a tree, which become ligneous in succession, and thereby indicate its age*.

If to these facts we are allowed to subjoin hypothesis, it occurs to us, that the elongation of every fibre of a human body, proceeds in its growth after the manner of the long bones, by an accretion of assimilated fluid to its extremities, and of cellular substance to its lateral surfaces. A celebrated anatomist from a similar idea has suggested, that the cellular tissue resembling the froth of soap suds, in the embryo, is primitively a nutritious fluid; and, as animal fibres never augment their number, it may increase their growth, by being spread over their surface like a varnish.

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* In the vegetable kingdom, growth has most force in the succulent and irritable parts of plants, such as the leaves and branches, which expand in all directions, while their harder and less irritable stems, undergo only slight changes. But the augmentation of trees, in which the growing principle of the kingdom is most manifest, does not arise from dilatation of vessels, as we can perceive the deposit of matter from the cortical part, forming new layers of soft alburnum every year, which are rendered denser in succession, by pres-

IV. Besides the specific action of the minute arteries, and absorbent vessels of the system, digestion, respiration, and secretion, are preliminary processes, required to complete the functions of nutrition and growth. The constant repairs, employed to supply the daily loss of substance, occasion such a perpetual permutation of living particles, that there is reason to believe, from what we observe, in the absorption of bones of animals fed on madder, and the regeneration of lost substance in a wound, or the recovery of parts from diseased organization that, in a healthy well-fed person in early life, the whole materials of the body are completely changed, according to the ancients, in seven or eight years, but, in our opinion, in a shorter time, notwithstanding all the organs continue, nearly of the same nature and form.

It is the perpetual application of fresh particles of nutritious matter to the substance of the body, that prevents its putrefaction, and sustains the growth of the various parts. We ac-

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sure and the actions of life, until the whole form a solid mass of wood, that gradually obliterates the spongy pith of the tree.

cordingly find the nails and beard renewed by protrusion, soon after they are cut away: the circulating fluids of healthy young persons, undergoing total renovation in the space of a few days: the soft solids are completely renewed in a few years, and, according to some authors, within periods of five years, by them called lustres. The bones, in which the circulation meets with most obstacles, are also renovated, according to Du-Hamel's experiments, although more slowly than the softer parts; and the true skin is regenerated with more difficulty than the other parts; since stains and small-pox marks continue, with little alteration through life; and wounds of the surface of the body, with loss of substance, are only cicatrized by scarf-skin.

The growth of the system, and the development of its parts, is a species of nutrition which depends still more on the state of the assimilating organs than renovation, and its powers cease at the meridian of life, while those of reparation continue nearly the same. But as the time the body requires for nutrition or growth, depends greatly upon the supply of food and its digestion, and upon the state of the pulmonary system, as well as the necessary waste of the body by excretion, they are subject to

great variation at different ages*. In the fœtus, the assimilated food is copious, in proportion to the size of the body, the waste by excretion hardly any, and the growth immensely

* The subjects of assimilation and nutrition may receive illustration, from comparing plants and animals. The nutritious substances drawn from the whole of organic nature, are converted by the powers of the stomach, intestines, and absorbent vessels of animal bodies, into a chylous matter, which is perfected in the lungs, and capillary vessels of the surface, while the recrementitious parts are expelled by the skin, bladder, and anus: which operations are not very unlike the assimilation of the fluids of the soil, by the vessels of the roots and leaves of plants, and the discharge of noxious particles from their external surfaces.

In the *Animal kingdom* all kinds of organic substances are assimilated, by the powers of digestion, into the same kind of bland chyle; but the union of atmospheric air is not less necessary to the restoration of organs, than the alimentary particles themselves, as appears from the copious formation of fibrin in the blood of animals after the commencement of respiration, and from their suffering from the degeneracy and privation of air, more than from the want of food. This indispensible pabulum of life, likewise disengages the animal heat, which escapes by the skin, and is of so much importance to nutrition, that it is always found existing in the ratio of the perfection of the species. Thus the largest animals which drink deepest of this fountain of life, possess the greatest share of animal heat, and have the most powerful muscular movements. But the assimilated aliment is not only necessary for the repairs and growth of the body, but is also

rapid. In infancy, the demands for aliment are incessant, the digestive and pulmonary organs are sound, the waste by secretion is profuse, and the enlargement of the body proceeds some-

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required as a stimulus to excite the capillary arteries of the surface to perform their exhalation and secretions, which renew the appetite for food.

In like manner the vessels of the roots of *Plants* act as lacteals, the sap-tubes as blood-vessels, the tracheal vessels of the leaves as lungs, and the vessels of the bark as secretory organs. By this simple structure of vessels, their assimilating power is so remarkable, that a beautiful diversity of size, appearance, smell, and taste, frequently proceed from air and water alone. Thus, it has been shewn by accurate experiment, that the juices of the birch and sycamore-trees, which resembled water when first absorbed by plants, acquired density and sweetness in ascending their stems, in consequence of the vital power of their vessels*. But a still greater change takes place in the extended surface of their leaves, from the inhalation of atmospheric air by respiration, and the exhalation of juices by transpiration; for when the nutritious fluid is perfected in the leaves, it generates a small portion of heat, and is conveyed to the bark, to repair the waste of organs, and to secrete the juices, which give the plant its distinctive characters and growth. Hence the nutritious grasses, fiery mustard, and deadly night-shade, derive their different properties from the same innoxious soil, and salubrious atmosphere, by a specific action of their vessels, which assimilate foreign bodies, water, air, etc. to the nature of the substance of their own systems.

* Mr. Knight's Expts. Phil. Transactions.

what slower than in the former period. In youth the assimilating powers are in their strongest state, the pulmonary organs capacious, the waste from the activity of the period great, and the body acquires its most perfect state of growth. In manhood, the ingesta and egesta are nearly balanced, and the growth of the body continues stationary. But, in old age, when the assimilated food is less than the evacuations, and both the activity of the body, and the capacity of the lungs are diminished, the organs decrease their size, and nutrition ceases gradually, together with all inherent motion, in a way we shall subsequently point out.

ESSAY I.

CHANGES OF THE HUMAN BODY, AT ITS DIFFERENT AGES.

WE proceed to the history of those parts of human structure which undergo the most remarkable changes from age, in hopes, that by comparing the state of the organs in the different periods of life, we shall be able to explain in a satisfactory way, the nature of the successive changes of organization, and the manner in which they dispose the body to a number of specific diseases. To arrive at these objects in a methodical manner, we shall divide life into five periods, each of which possesses a distinct degree of vigour, and dispositions peculiar to itself, while, at the same time, each period affects the productions of the one immediately following, in a way not very unlike to what takes

place in the vegetable kingdom, in the successive seasons of the year.

But to affix names and boundaries to each of the periods, involves a considerable degree of difficulty, on account of the variety of opinions, and the difference of situations, among mankind. Thus, the term infancy has been applied by many authors to the first five years of life, when the body and mind are yet in a state of imbecility; while its limits have been extended by others to the age of puberty, when animals become independent of their parents; and it has been protracted by the laws of this country to the age of twenty-one, when persons are no longer considered as minors. All the other divisions of life have been treated in a manner equally arbitrary; but the boundaries of the periods in relation to each other, and to the whole term of life, can be considered with accuracy only upon physiological principles. Such varieties of opinion, together with the difference of boundaries arising from climate, have determined the author to adopt the names in common use, and to affix the extent of the periods, by the most remarkable physiological changes which the body undergoes, among the inhabitants of these islands, in town and country situations collectively. This arrangement will be found, with

small variation, to apply to the generality of cases in every country of Europe.

The general divisions of the subject, therefore, are the *Fœtal state* of nine months; *Infancy* from birth to the end of the fourteenth year; *Youth* from that to the end of the twenty-eighth; *Manhood* from that to the end of the fifty-sixth; and *Old Age* from that to the end of life. But, at the same time, it is to be understood, that some of these periods vary in their relative extent, from the different length of life among the inhabitants of different regions, as well as in the instances of extraordinary longevity occurring in this country.

Each of these periods will be subdivided into two epochs, to mark more distinctly the different degrees of strength at their beginning and end, which will bring them near to the seven ages of Hoffman, viz. Infantia to the end of the 7th year, Pueritia to the 14th, Adolescentia the 21st, Juventus the 35th, Virilis-ætas 49th, Senectus the 63d, and Decrepita-ætas to the end of life; which divisions, in some respects, correspond with our epochs*.

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* Hoffm. Op. Om. tom. 5, p. 91, 1748.

A division of this kind did not escape the observation of the immortal Shakespear.

——— ——— All the world's a stage.

The coincidence of our divisions with the climacteric years of the ancients in Greece and Arabia, is not unworthy of particular attention.

And all the men and women merely players:
They have their exits, and their entrances;
And one man in his time plays many parts,
His acts being seven ages. At first, the infant,
Mewling and puking in the nurse's arms;
And then, the whining school boy, with his satchel,
And shining morning face, creeping like snail
Unwilling to school: And then, the lover;
Sighing like furnace, with woeful ballad
Made to his mistress' eyebrow: then, a soldier,
Full of strange oaths, and bearded like the pard,
Jealous in honour, sudden and quick in quarrel,
Seeking the bubble reputation
E'en in the cannon's mouth: And then, the justice;
In fair round belly, with good capon lin'd,
With eyes severe, and beard of formal cut,
Full of wise saws and modern instances,
And he plays his part: The sixth age shifts
Into the lean and slipper'd pantaloon;
With spectacles on nose, and pouch on side;
His youthful hose well saved, a world too wide
For his shrunk shank; and his big manly voice,
Fuming again toward childish trebble, pipes
And whistles in his sound: Last scene of all,
That ends this strange eventful history,
Is second childishness, and mere oblivion;
Sans teeth, sans eyes, sans taste, sans every thing,

The Play, *As you like it.*

Pythagoras, who derived his knowledge from the Chaldeans, Phenicians, and Grecians, applied the number seven to all sciences, physical and Divine, and his opinions prevailed so generally, that Hippocrates introduced the doctrine of time combating diseases, or critical days in fevers, upon Septenary principles. This doctrine became the theme of Galen, as well as of most of his followers; but Asclepiades, and a few other dissentients, asserted, that their patients were in no greater danger upon the septenary and demi-septenary days of Hippocrates, than on any other days of the disease. The late Dr. Cullen was decidedly of opinion, that fevers had a tendency to change upon quaternary and septenary days; and that the doctrine of critical days, as laid down by Hippocrates, was well-founded, even in our climate *. But physicians of the present day, who have neg-

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* This doctrine of numbers, therefore, prevailed a great length of time, as appears from the authors we have quoted, who have written in favour of the subject. Pythagoras flourished about 500 years before Christ. Hippocrates about 150 after him, and Galen 200 after the birth of Christ. Stahl's Work, Theoria Medica, was published in 1708. Hoffman's Oper. Om. Annorum Climactericorum, was published in 1748, and Cullen's first lines, were published in 1778.

lected those opinions, consider the struggle between nature and disease to vary in its periods, according to the virulence of the disorder, and the modes of treating it. The time of the crisis must also depend upon the age of the patient, and the nature of the climate in which he lives.

In a similar manner, the number seven was applied to the natural changes of the human body at its different ages. And soon after the time of Galen, we find the doctrine of climacteric years generally adopted by authors*. Some reckoned seven, multiplied by the odd numbers three, five, seven, and nine, to be climacterical; but they more generally estimated every seventh year, as a remarkable one. Thus the 21st, 35th, 49th, and 56th years, were supposed to bring some change to the health of the human body, and the 63d was the grand climacteric, so menaced with the storms of age, that the ancients usually congratulated each other on passing it. But soon afterwards physicians adopted nine, the magical number of the Arabians, and

* The name is derived from the Greek word climacter, the scales or rounds of a ladder.

multiplying nine by nine, made the eighty-first another grand climacteric year *.

Stahl supported the doctrine of climacteric years, but expressed doubts as to the changes of the body depending upon the seventh number, and recommended the subject to the attention of future philosophers. Hoffman, who wrote largely in favour of climacteric years, likewise denied their depending upon the force of numbers. The moderns, however, are satisfied, from bills of mortality of different countries, which are better modes of calculating than any known to the ancients, that no fatality attaches to the 63d or 81st year in particular, nor, indeed, to any one year more than another, but that there is a gradual increase of chances against the life of the individual, from the 6th or 7th year of infancy, to the greatest extent of human duration.

Notwithstanding the author of the present

* The Arabian number nine is the most remarkable of all the units. Thus, when nine is multiplied by any figure or figures, the digits in the product being added together, make up the number nine.

Thus, for example, 9×3=27, and 2+7=9.

Again, 9×40=360, and 3+6=9.

treatise, does not ascribe efficacy to particular days, nor sudden danger to the natural changes of the body, yet he cannot avoid noticing the coincidence between the number seven, and the periodical changes of the human system. It is certainly greater, than any regular occurrence of critical days in diseases; for if we view the revolutionary movements of the body in a general way, we find the growing period of twenty-one years to be a triple septenary. The firm, or stationary state of the organization, to continue another twenty-one years; and the general decay of the body to last twenty-one years longer, which terminates in the grand climacteric of the ancients. If we make a more particular observation of the changes going on in the body, we find the fœtus can live *ex utero* in the seventh month; the child acquires teeth at seven months after birth; and it learns to walk in seven more.

But the septennial evolutions of the machine, are still more remarkable than any changes upon septenary days and months, for there does not occur seven successive years in the life of man, without some evident alteration of constitution, which will become apparent in the course of the present narrative. We may, however, in the mean time, instance the re-

newal of the teeth at the seventh year, the arrival of puberty at twice seven, full stature at three times seven, the perfection of growth at four times seven, the greatest vigour of body and mind at five times seven, the commencement of partial decay at six times seven, general decay, and decrease of energy at seven times seven, the arrival of old age at eight times seven, and the grand climacteric of the ancients at nine times seven, which the author has always observed to come nearer the extent of life, enjoyed by persons who have always lived in London, than any other term that could be chosen for general calculation.

Although these septennial distinctions, might have constituted physiological divisions of our subject, more minute than those we have chosen for this treatise, they would not have been so conformable to modern language, nor to the usual modes of treating of age, in this country; but still we have not neglected to consider them in the subdivisions of the subject.

CHAP. I.

PROGRESSIVE CHANGES OF THE BODY, DURING ITS FŒTAL STATE.

THE age of man has usually been considered as commencing at birth, but his primitive existence for the nine months succeeding conception, is an important portion of his life, which should not be omitted as part of his age, since it lays the foundations of the future machine, and is attended with more remarkable changes of structure, than appertain to any other period of human existence.

It is generally believed that the human body commences by secretion. The ovum secreted by the ovarium of the female from her spermatic vessels, is roused to action by male influence, which pervades its gelatinous substance so ef-

fectually, as afterwards to produce the hereditary diseases of both sexes. To illustrate the subject, we may instance the partial repetition of generation in a wound, of which we have ocular demonstration. A cavity made in the substance of an animal, soon becomes filled with a glutinous fluid, which grows gradually denser by age, and in time exhibits the same structure of vessels and nerves, as the surrounding parts. The new fibres which appear in this indurating matter, have evidently obtained their life from the original vessels which secreted the fluid, for they possess the same properties and propensities, as the vessels which gave them birth*. In like manner, we apprehend the secretions of the parents, transfer living powers from the old to the new materials of a human being; but its existence afterwards must depend solely upon the mother, of whom the embryo is a part; we shall however strive as much as

* "It is not coagulable lymph which is deposited from the "vessels of inflamed parts, but what has undergone changes "in its passage through them, partaking of the disposition "of the solids through which it has passed. Hence adhe-"sions, tumours, venereal and cancerous affections, partake "of the nature of the diseased solids that produced them." Vide Mr. Hunter's posthumous works on the uniting medium; and Dr. Haighton's experiments on the reproduction of nerves in a wound. Philos. Trans. abr. vol. xvi.

possible, to confine our attention to the economy of the fœtus, as a separate individual.

A human conception appears at first as a minute vescicle, proceeding from the ovary of the female parent, with the determined figure of an ovum, and composed of a pellucid fluid, contained in a double membrane. The embryo, on opening this vescicle, can soon afterwards be discovered, like an opake spot, which goes on from the time of impregnation to encrease its bulk daily. The earliest preparations of embryos we have heard of, are in possession of Dr. Ramsbotham of the city of London. The author of this treatise discovered one of these embryos within the divided ovum, by means of the microscope, which he could afterwards see distinctly with the naked eye, not so large as a grain of pearl barley, and assuming the curved shape. The mother had cohabited with the father only three nights, and she miscarried in twenty-three days from the first night, so that it is fairly considered to be three weeks old. But the doctor has also in his museum an aborted ovum of nineteen days, with the embryo about the size of a small pin's head; and an ovum of sixteen days, about the size of a hazle-nut, in its unopened state.

We cannot, therefore, be surprised, that the

knowledge of our origin should be involved in impenetrable obscurity, since the elementary parts of the embryo are so minute, as to require near three weeks to render its form conspicuous, notwithstanding we have reason to suppose, from the uniformity of nature's laws, that it must have grown, from the first moment of conception, with as much rapidity as after the time of its becoming visible. How inconceivable then must the tenuity of matter be, when we are also informed by a celebrated physiologist, from calculations of the rudiments of the body, as objects of microscopical observation, that " all the stamina from which man is at " first derived, cannot contain so much matter as " to equal a quantity of water of no greater " weight, than the 42 quadrillionth part of a " grain, and that the sensitive parts of the human " body must therefore be infinitesimal*."

In the First Epoch, the changes of the embryo are so obscure, that we know not whether it is nourished by absorption like vegetable bodies, until it inosculates with the uterus, nor do we know the precise time that it takes, to pass from the ovary to the fundus of that organ. When it gets into the uterus, the shaggy and downy surface of the

* Sir Clifton Wintringham on the exility of vessels, 1743.

chorion attaches itself to its fundus, or most vascular part, and the cervix of the womb begins to close, for the future protection of its contents. Baron Haller never found it in the uterus before the 17th day; but there are some facts discovered of this age, on which we can have a more perfect reliance.

One of the most distinguished physiologists of Europe, has described the ovum between the third and fourth week, to be an oval vesicle, about five Parisian lines in diameter, turgid with limpid water, and covered with a double membrane, the chorion and amnion*. When he washed it with spirits of wine, an opake body scarcely surpassing a Parisian line, appeared by the microscope to adhere by its umbilicus to the ovum. The size of the head exceeded that of the whole body, and the superior and inferior extremities appeared like small tubercles, or germs of a plant, beginning to sprout.

From these and other facts of a similar nature, we suppose, that although the elements of every part of the body are coexistent, yet all the organs are not formed at the same time. Neither the organs, nor their functions, appear coeval†. The vascular system begins to act

* Icones embryonum, S. T. Soemmering, 1799.

† Halleri Physiologia, tom. 8.

first, although its functions are not completed till after birth. The stomach and lungs do not perform their functions until a similar period. The testes do not begin to secrete until the age of puberty, nor the functions of the brain and nerves to acquire their perfection until adult years. In like manner, the order in which the parts of the embryo make their appearance, is, first the head and spine, then the thorax, next the abdomen, at length the superior extremities, and finally the inferior ones. The succession of internal parts appear to be the brain, the spinal marrow, the nerves, the great vessels, and the heart, which may be discovered beating soon after six weeks. But the law which occasions the growth of the body to proceed from above downwards before its uterine attachment, is not understood; we however observe, that the first formed parts are first completed, and that constitutional diseases have a similar tendency, to invade the superior parts before the inferior, through the whole of the growing period.

We are sensible that many persons consider the changes of the embryo, merely as a successive development of pre-existing parts, and that all organic beings were inclosed in the ovary of each species, in a miniature form, from the creation of the world, and were only brought

into view by the stimulus of impregnation, and growth. But the greatest number of modern authors have discarded the germ theory, and adopted the doctrine of Epigenesis, which supposes that animals and plants are formed seperately in succession, by the same organic power that is intrusted with their preservation*. The appearances of mule animals, and hybrid plants, in the likeness of both parents, the propagation of animals and plants by subdivision, and the reproduction of new parts after the old ones have been destroyed, are phenomena which can only be satisfactorily explained, by considering them to be the operations of a living principle, imparted to individual beings in successive order.

The eyes are the first organs of external

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* Several very satisfactory experiments have lately been made in the vegetable kingdom by Kœlreuter of Germany, in proof of the doctrine of Epigenesis. By fecundating the pistilla of the nicotiana rustica, which has egg-shaped leaves, and yellowish corals, with the pollen of the nicotiana paniculata, which has a stem twice as large as the former, and round leaves, with greenish petals, a hybrid plant was produced resembling both species in every part. In like manner, by afterwards impregnating this hybrid with the pollen of the male parent, new plants were obtained, which resembled the father; and in the course of some generations the same kind of fecundation, changed the nicotiana rustica into the nicotiana paniculata. Wildenow's Botany, p. 326.

sense, for they can be distinctly seen like dark spots, with their palpebræ shut, before the end of the second month. The mouth soon afterwards becomes conspicuous, for at the beginning of the third month, the lips appear closely shut.

The liquor of the amnion, intended chiefly for the protection of the embryo against external injury, diminishes in relative quantity as the new being gains size. Hence an embryo little larger than an ant, is surrounded with an ounce or more of water, and becomes nearly of equal weight with the surrounding fluid, before the fourth month. But when the fœtus weighs eight or nine pounds, at the full period of gestation, the serous fluid seldom exceeds three pints. The decrease of this liquor, may therefore be a principal cause of determining the length of the uterine period; and it is an established fact, that when it is suddenly evacuated by accidental rupture of the membranes, it occasions premature labour at any time of pregnancy, by permitting the naked fœtus to come in contact with the parietes of the womb.

Towards the fourth month, it is known by the name of fœtus; it may then be the length of three inches, in its curved posture, the surrounding fluid about four ounces, and the

weight of the whole ovum at least eight ounces. It receives nourishment from an attachment to the womb by the placenta and funis, which are also productions of the new generation. As a provision against interruptions in the circulation of the nutritious fluid, the chord in its natural state is never on the full stretch, notwithstanding the fœtus, from the earliest period appears pendulous, with the heaviest part, the head, downwards, which is merely a position prepared by nature for the act of delivery.

Between the fourth and fifth month, but most commonly about the eighteenth week, a considerable change takes place in its situation. The ovum becoming too bulky to remain in the pelvis of the mother, the uterus with its contents, rises from under the pubis, and becomes a viscus of the belly, which strongly impresses the mother with the first sensations of the life of her child, and places it in a situation to afford her afterwards, frequent indications of its involuntary movements.

The SECOND EPOCH of fœtal life, which we date from the beginning of the seventh month, forms a natural sub-division of the period; for, although there does not occur any sudden change in the structure of organs, and the fœtu deve-

lopes at all times, in a gradual manner, both with respect to structure and living powers, yet it has become so complete in its different parts, and its organs are so distinctly formed at this age, that it can live ex utero, and the anatomist can trace the adult form in all its organs. Hippocrates has accordingly observed, that the life of the fœtus is in greatest perfection at the end of the seventh month, in so much, that a child born in seven months will live, while one in the eighth month will not live; whereas the moderns consider an eight month's child to be the strongest, and more likely to live than one of seven months. We cannot, however, help observing of Hippocrates, who has generally stated facts in the most simple and concise manner, without reference to any theory, how much he leaned to the Pythagorean philosophy in this instance, when he further adds, that life commences in the fœtus on the seventh day; an opinion which is not more credible than the former *.

It is perfectly obvious, that some of the fœtal organs are temporary constructions, for the immediate purposes of nutrition, while others are preparatory conditions of the perma-

* Hippocrates de septimestri partu, vol. I.

nent organs, to fit them for a more perfect state of existence *.

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* The temporary structures of the fœtus, are found in the great cavities of the body.

The *Head* is remarkably large, and the bones at the top of the cranium are united by a wide membrane. The eyes prominent, and the pupillary membrane, fills up the aperture of the pupil, connected to the capsule of the crystaline lens, which becomes deciduous in the seventh month of pregnancy. The crystalline lens of the eye is nearly spherical, and its capsule extremely vascular. The ear is ossified internally and the cartilaginous meatus, adheres externally to an imperfect bony circle. A mucous membrane covers the membrane of the tympanum and external opening of the ear, which is absorbed immediately after birth,

The *Thorax* is so small, that it is nearly filled with the thymus gland, which contains a lymphatic fluid, and extends from the neck to the diaphragm, but diminishes in size as the other viscera of the thorax increase, and becomes wholly absorbed before 16 years of age. The mammæ of the breast are turgid externally, and pour forth a lymphatic fluid at a later period. The lungs are compact, and of a dark colour, but become light and spongy when the atmospheric air enters them. The pulmonary artery sends off the ductus artèriosus to the arch of the aorta, and the foramen ovale preserves a communication between the sides of the heart, until the lungs receive the whole blood at birth.

The *Abdomen*, equal to a 'hird of the whole body, is penetrated at the umbilicus by the chord. The liver is remarkably large, of a red colour, and occupies both hypochondres ; hence the stomach, which is rounder and relatively smaller, than in adults, is kept from its tranverse position, and lies

The principal differences of the fœtal organs from those of the child after birth, consist in certain *temporary* conditions of the vascular system, which occasion the characteristic forms of the fœtus. The collapsed state of the lungs, on account of the fœtus receiving aeration from the mother, occasions the vessels to be so distributed, that half the blood passes directly by the oval opening to the left side of the heart, without entering the lungs, and half of the remaining portion passes from the pulmonary artery by the arterial duct, to the descending aorta, so that

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almost perpendicularly, in early pregnancy. The appendix vermiformis is large. The umbilical vein passes between the two arteries of the chord, from the placenta to the left lobe of the liver. The kidneys are small, and consist of many distinct lobes, which unite at birth. The renal glands of a red colour, are nearly as large as the kidneys, with a cavity containing a black fluid, and without excretary ducts, but they are effaced soon after birth, when the blood takes a determination to the kidneys.

The *Pelvis* is remarkably small in relation to the rest of the body. The urinary bladder of an oblong form, extends to the umbilicus, and is more completely covered with peretoneum than in adults. The internal iliac arteries send off the umbilical arteries of the chord. The uterus is large, and the ovaries small and long. The testes begin to descend from near the kidneys, after the eighth month, and are found at the abdominal rings at the end of the ninth.

not more than a fourth part of the whole mass, penetrates the lungs before birth, intended for the purpose of their nourishment alone. In consequence of this, the thorax is found remarkably narrow, but it suddenly expands, and assumes more of the adult form, after the lungs have received the whole circulation at birth.

Another temporary distribution of vessels, provided for the nutrition of the fœtus engrafted upon the circulation of the parent, produces a peculiarity in the fœtal organs. The mass of blood, after it has been aerated, and otherwise improved in the cells of the placenta, is returned by the umbilical vein to the liver of the fœtus, where one portion is circulated through that organ, and the other conveyed by the venous duct, directly to the right side of the heart, and from the aorta to the brain. This large quantity of aerated blood passing directly to the superior parts of the fœtus, expands them more than the inferior parts; and the same peculiarities in the distribution of vessels, augment the bulk of the liver and spleen so much, as to give the belly a prominent and long appearance, which becomes still more obvious, by the want of curvatures in the spine, to contain the abdominal and pelvic viscera.

At the same time, the blood passing to the

chord, directly from the iliac arteries, lessens the circulation in the lower parts of the fœtus so much, that its pelvis and lower extremities are remarkably diminutive; the growth of parts at all times depending on their supply of arterial blood.

The fœtus, instead of increasing its bulk more rapidly at the end, than at the beginning of gestation, as some accoucheurs have supposed, the force of its growth declines in a gradual manner, from the earliest appearance of the embryo, until the body arrives at its acmé in adult years. Thus the human body, which acquires eighteen inches in length during the first nine months of gestation, gains only eighteen inches more, in three years after birth, and in the succeeding sixteen years, when it is near six feet high, it has not received so great an increase of height, as it did in the first four years of existence. In like manner, if we suppose half an ounce of living matter to be added to the primitive stamina, every day, for the first nine months, to bring the fœtus to the weight of nine pounds, there will only be required the daily increase of a third of an ounce, to bring the body to the weight of eleven stone, at twenty years of age. But the sources from which the fœtus derives

the increase, has ever been matter of controversy, on account of there being no direct communication of blood vessels, from the mother to the fœtus. The most minute injection cannot be made to pass the arteries of the chord, to the uterus, since it will sooner return by the branches of the umbilical vein than fill the uterine vessels, nor can it be positively proved, that the fœtus receives any of the blood of the mother. The two circulations are so distinct, that the pulse of the child has double the velocity of that of the mother, and yet the child dies when the circulation is stopped in the chord. But it is generally believed, that a lymphatic or serous fluid is absorbed by the vessels of the fœtal placenta, which is derived from the circulation of the mother, otherwise its rapid enlargement to eighteen inches long, and eight or nine pounds weight, in nine months, could never be explained. This hypothesis receives an additional proof, from the emaciation, and restlessness of the parent, in the advanced stages of pregnancy, in consequence of the demands the child makes upon her system, while, at the same time, the waste of the fœtus by excretion, is scarcely worthy of notice.

The question has often been agitated, which of the parents contributes most to the similitude

of features, and the specific qualities of the offspring? There can be little doubt, that the female parent contributes most to the size of the fœtus, since she is the only source of its nourishment in the womb; and we so often find the size, form, and health of the offspring depending upon the mother, that some late writers have recommended the females of grazing animals, to be chosen of larger size than the males, as well as the best feeders to be selected, for improving the size of the varieties*. But a celebrated author has extended maternal influence much further, when he says, "that a handsome "woman has always fine children, while by a "handsome man, an ugly woman has children "still more ugly than herself†."

The *permanent* organization, in a state of preparation for a more perfect existence, includes more especially the skin, bones, muscles, glands,

* Mr. Cline on the form of animals.

† Buffon further states in proof of the species depending most upon the mother, "that sheep propagate alike with the ram or goat, and produce lambs, which resemble the female parent, and that mules got from a mare and ass, resemble the mother more than the father." Buffon, translated by Parr, vol. 8 and 9.

and nerves, which require a separate consideration, that we may be able to compare them with the state of the structure, and its changes, in after periods. We must therefore trace in a brief manner, the structure and changes going on before birth, in the organs which are to continue through life.

The *Skin* is of a red colour, inclining to yellow, and its appendages, the nails, are seldom horny, before the ninth month. Its florid state, from the immense number of capillary arteries it contains, is the chief cause of the rapid growth of this age, and explains the reason of the adhesions, and cuticular diseases, peculiar to fœtal life. But the skin would be still more obnoxious to these affections, if it was not protected by a fine downy hair, and by a suety matter on its surface, which increases as the liquor of the amnion relatively decreases, towards the end of pregnancy.

The Flat *Bones* are formed upon cartilage or membrane, and the cylindrical ones upon cartilage, which is gelatinous in the embryo, cartilaginous in the fœtus, and nearly osseous at the end of pregnancy: but in their softest state they possess the adult form, covered with periosteum. Osseous points commence on the membranous

cranium to form parietal bones, before the end of the third month, and are not completed till after birth: whereas the bones of the internal ear are complete at the time of parturition, and the external meatus continues an imperfect circle of bone, for some time afterwards. Ossific points also appear at the centres of the cylindrical bones about the same time as in the flat ones, and while they become tubular, with lamina added internally, their surface is ossifying, but their epiphises are not combined with the bones before eighteen years of age. The bones of the inferior extremities, which were smaller than the superior ones, acquire equal size about the beginning of the fourth month, and the lower ones afterwards surpass those of the superior extremities, more and more, until they make half the stature of the body at twenty years of age.

The *Jaw bones* contain the rudiments of alveolar sockets, and pulps of teeth, about the fourth month, but ossification does not commence on the tips of the incisors, before the fifth or sixth month. The rudiments of the adult teeth can be seen at the same time, like small points at the bottom of the milk teeth.

The *Muscles* have pale weak fibres, composed of gelatine, with little fibrin. The inactivity of the fœtus has given rise to an opinion that it

exists in a state of continued sleep, although it sometimes communicates sensations to the uterus with its elbows and feet; but the torpor may depend greatly upon the want of power of action, since the muscles are found nearly paralytic at birth, and unable to support the body for months afterwards, until the tonic powers of the atmosphere operate upon the slender semifluid organization.

The *Glands* are in a remarkable state of torpor, at this age. That their functions should be suspended until the child arrives at the light of day, would lead us to suspect a defect of serosity in the blood, or a want of sensibility to their natural stimulus. The quantity of the urine, which would become copious if the fœtus were prematurely born, is so inconsiderable, as hardly to deserve notice, and the same deficiency appears in the other secretions. Some bile and reddish coloured fat, are secreted before the fifth month. The gall bladder contains only a little bile, of a colourless, insipid nature, and the stomach a small portion of glary fluid, towards the end of pregnancy. But the colon and ilium contain a large quantity of green meconium, without any other kind of fœces. No doubt the flow of blood to the kidneys, in their incomplete and diminutive state,

is little, but we have reason to believe that the glands commence their secretions at certain periods, like the evolutions of the other organs at certain ages, as is particularly observable in the secretion of the testes at puberty; and that the function of secretion, like that of digestion, not being wanted before birth, the operations of the system are confined entirely to the growing process, until these functions are called into perfect action, by air, motion, &c.

The *Brain and Nerves* are remarkably large, in relation to the bulk of the fœtus, as the disproportioned cranium obviously denotes. But it appears larger than it really is, from the unformed state of the sinuses, lower jaw, and teeth, which unite in rendering the face diminutive. There are no convolutions in the brain at four months, and it is of a watery texture, that it may not receive injury from compression in time of labour. Indeed all the nervous system is pulpy, and without functions during the whole of the uterine period. The confined situation of the fœtus, excluded from all kind of communication with the external world, and the tardy process of forming a nervous system, preclude the functions of sensations and voluntary motion. There can be no feeling in utero, where there is no consciousness. We might as

well ascribe sensibility to a decapitated body, as to the child in utero; for which reason we find the child dies in the womb, without the knowledge of the mother, and without a struggle or expression of pain, when wounded with instruments in laborious parturition *. It is therefore reasonable to suppose, that the rapid preparation of the organs for independent existence, depends in great measure upon the want of sensation, as well as of respiration, which permit the entire powers of the system to be directed to the formation of the body.

The *term of gestation* is more precisely limited, than any period in the age of man; for however much either puberty, manhood, or old age, may be varied in their duration, we know no powers that can change the natural term of human parturition. It takes place between 273 and 280 days after conception, in all climates alike. Dr. William Hunter, however, gave an opinion to the judges, that although the usual period of gestation was forty weeks,

* An elegant author met with considerable opposition when he first promulgated the opinion, now generally believed, that the fœtus is totally devoid of sensation in the uterus, viz. Dr. Osborn on difficult Parturition, p. 149. 1792.

or nine calendar months, yet a difference of from one to three weeks, sometimes happened, from unknown circumstances; and that he knew a woman bear a living child in a perfectly natural way, fourteen days later than the nine calendar months. The law of the land is therefore not definitive in this respect, since the period of forty weeks admits a presumptive heir from the death of the husband, but is not considered as an absolute proof of illegitimacy *.

At the time the fœtus has acquired the length of eighteen inches, and a weight of eight or ten pounds, the relative increase of the uterus, and the quantity of fluid surrounding the child, have not kept equal pace with the growth of the fœtus; an irritation therefore arises in the uterine organ, with which every part of the body sympathises, to bring the matured fruit to the light of day †.

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* Jacob's Law Dictionary, second edition, on bastardy.

† The similitude of this period with the incipient life of other creatures, is very remarkable, and it is now acknowledged that the doctrine of Harvey, "*omne virum ex ovo,*" is the general law of nature.

Microscopic animals are produced by such an obscure process, that the doctrine of equivocal generation exploded by the discovery of the microscope, which demonstrated eggs

Sudden relaxation commences in the uterine system, the fœtus sinks in the pelvis, and an increased secretion of mucus precedes the pro-

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and seeds in certain substances, undergoing the process of fermentation, has in some measure been renewed, by the farther observation of animalcules, living in watery infusions of animal and vegetable matters, after their ebullition and exclusion from the atmosphere; and there is reason to believe that as the microscope undergoes farther improvements, others will be found in decreasing series, which must preclude every kind of explanation of the subject from actual observation. Dr. Darwin's account, of what he terms solitary generation, is not a satisfactory one. He says, "Organic particles of dead vegetables and animals, during their chemical changes into putridity or acidity, do not lose all their organization or vitality, but retain so much of it as to unite with the parts of living animals in the process of nutrition, and produce new complicated animals by secretion, as in generation, or produce very simple microscopic animals and vegetables, by their new combinations in warmth and moisture." Temple of Nature, note to Canto I.

We are however convinced that every living creature has been unequivocally derived from parents of the same species with itself, and that ova of infusoria animalcules, and seeds of vegetable mucor, float in the atmosphere, in states of imperceptible minuteness and indestructibility.

Oviparous animals, strictly so denominated, deposit their embryos, with a portion of prepared nutriment, in some foreign situation, where it can receive warmth for development, and food for future support, which enables the parents

cess of expulsion, for which purpose its bony fabric is admirably prepared. The cartilaginous state of the bones, the flexible spine, with tu-

to multiply their brood to an immense amount. Most small animals generate in this way, and their fertility being nearly in the ratio of their size, they constitute by far the most numerous orders of the animal kingdom. Thus the ova of gnats, butterflies, and birds, are propagated profusely several times a year. Their eggs are laid, and completely hatched, in three or four weeks at farthest, and the young are immediately capable of providing for themselves.

The egg of the domestic fowl derives its yolk from the ovary, and its nutritious whites and shell from the oviduct, which conveys it to the external world. The changes commence from external heat in the cicutricula, by a white spot appearing at the obtuse end of the egg. In three days the spine, eyes, and pulsating heart of the young animal become conspicuous. In two days more, lungs incapable of functions, are discovered. On the fourteenth day feathers appear; on the nineteenth the chick makes noises; and it breaks through its shell on the twenty-first day. The chick derives nutriment during incubation, from the whites, and at last from the yolk of the egg, which waste gradually as it increases in size, not unlike the germination of a plant, from the mucilaginous cotyledons of the seed.

Viviparous Animals, consisting of man and quadrupeds, do not confide their scanty and valuable progeny, to a precarious supply of heat and nutriment, but they retain the embryo within their own bodies, which they nourish until it acquires a certain size, and the mother's organs are sufficiently developed, to supply it with food, in the helpless state of its in-

bercles instead of processes, the narrow thorax and pelvis, and the incomplete cranium, are the only conditions of the machine, which could

fancy. Hence their long periods of gestation and suckling, allow time for a greater increase of size, and perfection of organization, but at the same time, limit the number of the species. Quadrupeds, of course, seldom produce more than three or four young in a year, and the human species not more than one upon an average of two years. In short, every species of female animal, except zoophites, possesses one or two ovaries, wherein the rudiments of the embryos are formed, and the only difference among them, consists, in the ovum of the one species being immediately conveyed by oviducts to the external world to be nourished, and in the viviparous, by fallopian tubes to the uterus, to be supported by the mother, in the manner we have described of the human body.

Gemmiparous Animals, such as Zoophites and some articulated worms, which connect the two kingdoms, discover no distinction of sexes, and multiply like plants, by shoots on their surface, as has been accurately traced in the Polype. The young issue in clusters from the side of this animal, appearing at first in protuberances, the size of a pin-head, which enlarge and put forth arms, and as they drop off, others succeed, and often push forth another generation, before the first falls from the parent; but the most remarkable circumstance of this animal is, that on cutting it, every minute portion becomes a new animal, probably from an infinity of germs existing on its surface, in the manner of vegetable bodies.

Plants are propagated by seeds, or by buds analogous to seeds, in a way similar to oviparous and viviparous generations.

render human parturition practicable. But these imperfect states of fabrication are, at the same time, attended with a protracted formation of

The *seed* containing the embryo, takes shelter on the appearance of winter, in the bosom of the parent of nature, and when the great birth-day of vegetable bodies approaches, its vegetating powers are roused to action by the stimulus of heat and moisture. After four or five days, the rostel of the seed, the living ens, sends forth a radicle like a white prominence, from the bottom of the seed, which subdivides into two or three smaller radicles, that strike downwards to form roots. Hence it appears that the radicle constitutes the plant, and that the stems, leaves, and flowers are only prolongations of the root, to prepare juices to characterize the species. The Plumule or rudiment of the stem, sprouts in a day or two after the radicle, from the same end of the seed, ascends upon its surface, and in many instances in less than ten or twelve days, penetrates the husk, and assumes a leafy appearance. It is nourished during this period by the lobes of the seed changing to a saccharine matter, which is conveyed by vessels to the radicle, and from thence to the plumule, until the whole lobes are absorbed, and the plant sends forth the seminal leaves for respiration. It then prepares its own nutriment from the fluids of the soil and air. This process is therefore, not unlike the birth of an *oviparous* animal.

In like manner, the embryo plant protected from the cold of winter in the *bud* of the tree, or *bulb* of the root, derives its nourishment from the circulation of the parent, like the fœtus in utero, and in the manner the oviparous plant does from the cotyledons of the seed. When the annual influence of solar heat returns, it is protruded through the bark to form shoots,

organs, which exposes the infancy of the human species to an infinite number of diseases.

Human beings may be called uniparous, as they seldom bring forth more than one child at a birth, although nature has provided the female with two nipples, to suckle a greater number. Twins do not occur oftener than once in eighty or ninety births, according to calculations from data collected in different parts of Europe, and the greatest number of these consist of female children. Triplets are very rare, and four at a birth do not occur once in several hundred thousand instances of labour.

A well authenticated fact is recorded, of five fœtuses brought forth at a birth, all of them nine inches long, and two of them alive, at the twentieth week, which were deposited in Mr. Hunter's museum *. The histories of greater numbers at a birth, are not wholly to be discredited, although many of them border on the

which continue to receive nourishment from the parent tree, after the offspring has arrived at the light of day. After this manner, the vernation of germs, which every where exist on the surfaces of the branches and bulbous roots of plants, gives the vegetable kingdom inconceivable powers of reproduction, by a process of propagation, which is not very dissimilar to the gestation of a *viviparous* animal.

* Phil. Trans. ab. vol. 15, p. 296.

miraculous; but the capacity of the uterus and abdomen not admitting of numerous fœtuses, to come near the full growth of the period, they induce a morbid state of the fœtal or maternal system, which occasions the children to be born dead, or to die soon after birth. Even the common cases of twins, are frequently brought forth in a monstrous state, and the most perfect ones are remarked for not arriving at the greatest extent of longevity.

CHAP. II.

PROGRESSIVE CHANGES OF THE BODY IN INFANCY.

THE period of human life from birth to the end of the fourteenth year, has usually been reckoned the first in the age of man, but improperly so, for the reasons before assigned. Tenuity of solids, superabundance of fluids, rapidity of circulation, and sensibility of fibre, characterize this age more than any subsequent one, which will become perfectly apparent by tracing its history.

In the FIRST EPOCH, from birth to the end of the seventh year, the *Infantia* of the ancients, we find the principal evolutions of the body occurring at the time of birth, and at the dentition which immediately succeeds it.

The first and most important evolution is, the emancipation of the human being from its state of confinement and insensibility, to the exercise of self-existing powers in an unlimited space. The intercostal muscles and diaphragm commence an action, which permits the air by its gravity to dilate the lungs, and the whole mass of blood

to circulate through them. Although it would not be proper on this occasion to enter into the question, whether the first action of these muscles arises from the stimulus of air upon the pituitary membrane, or from a sense of suffocation in the pulmonary organs, yet it becomes essentially necessary to inquire into the effects, that the change produces upon the general system. The enlargement of the cells of the lungs by inspiration, determines the blood to this place of diminished resistance, where it necessarily undergoes considerable changes. It is immediately sent from the left side of the heart, of a redder colour, more frothy, lighter, and warmer, in consequence of the oxygene it has imbibed from the atmosphere, which at the same time increases the temperature of the body, and rouses the energies of the system to new actions *.

The blood being diverted from the oval opening of the heart, as well as from the umbilical vessels, the accessary structures of the arterial and venous ducts begin to close, and an equilibrium of circulation to be established, between the superior and inferior parts of the body.

* Since these sheets were put to press, the Author has seen the Croonian Lecture, publishing for the Royal Society, wherein a set of Experiments, happily devised by Mr. Brodie, tend to prove, that animal heat depends on the nervous system, rather than on the respiratory organs.

The increased flow of blood to the lungs, together with the augmented capacity of the thorax, and the new supply of fibrin, by the action of the atmosphere, give the muscles fresh strength and energy, to overcome the habits of the uterine position. The stomach, as well as some other viscera, have their situation changed, by pressure of the diaphragm, and action of the abdominal muscles; and the liver, from its diminished circulation, decreases in relative volume; while the internal iliac vessels receiving the whole blood, the size of the kidneys, pelvis, and lower extremities, receive rapid enlargement. During these sudden changes, the testes drop from the abdominal rings, and carry with them a portion of peritoneum, to form their vaginal sac.

The urine is evacuated a few minutes after birth, but the meconium is seldom passed until the bowels are excited to action, by the cathartic properties of the mother's milk, or of some artificial stimulant; the bile begins then to flow regularly, and the fœces to become yellow.

Bonds of union still exist between the mother and child, for it has no sooner acquired the powers of voice, than a connate sense of hunger, impels it to make demands for the assimilated nutriment it has provided for itself, and phosphate of lime, which abounded in the mother's urine, is

now found in the milk of the breast, ready for the consolidation of the infant bones *. The children of this country are therefore put to the breast in six or eight hours after birth; and lactation is continued eight or nine months, the usual time that the stomach requires to gain strength sufficient to digest solids, and that four incisor teeth make their appearance above the gums.

The next great change is observable in the first dentition. The pulps of the deciduous teeth concealed in the jaws of the fœtus, growing constantly harder and longer, produce at length absorption by their irritation, soon after birth, and those with sharpest points rise first above the gums. There is a great variety in the times of their appearing, from incidental circumstances of growth and debility, but it most commonly happens, that a middle incisor tooth, perforates the gum about the sixth or seventh month, in the centre of the lower jaw, and in a few days, is followed by an adjoining one. In a few weeks more, two opposite incisors appear in the upper jaw; and all the other teeth succeed below and above by pairs, at different periods, nearly in the manner of the first ones, until the child has got

* The milk of the human breast contains phosphate of lime, magnesia, and iron. Thomson's Chemistry, vol. 5. b. 5.

eight incisors, four canine, and eight molares, which completes the number of twenty milk or deciduous teeth, and finishes the first dentition, generally in a little more than three years *.

The round faces of children gradually assume a new appearance as the teeth develope. Thus the jaws are nearly semicircular until three years of age, but lose their rotundity afterwards, by elongation of the maxillary bones.

In order to understand the changes that the organization of the body undergoes through life, it becomes necessary to take a brief survey of it in the infant state, and we shall find those parts which differ from its adult structure, to consist chiefly of the following.

The *Skin* in early infancy is soft, vascular, and possessed of so much delicacy, that it is liable to excoriation from the smallest neglect of cleanliness, which is the reason that the breech of infants is so often inflamed by the urine. The numerous capillary vessels of the skin exhale

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* As writers differ considerably about the appearance of the twenty milk-teeth, the following table was given the Author by an eminent teacher of anatomy in London.

The situation and general order of their succession, is represented by the increase in the power of figures, and 0 stands for ten.

	Molares, &c.	Incisors.	Molares, &c.
In the Upper Jaw	9 5 7	3 2 2 3	7 5 9
Lower Jaw	0 6 8	4 1 1 4	8 6 0

copious vapours of a less acrid nature, at the beginning than at the end of the period. These preserve the surface in a moist and sensible state: but as the cuticle and subjacent mucus indurate by air and pressure, the skin loses part of its transparency and florid colour, and becomes gradually more firm, and less irritable. The most important condition of the external surface in this early age, consists in its extreme sensibility, from an almost bare state of the nerves, covered only by a fine thin cuticle. In this way, the nervous papillæ of the fingers, become a valuable means of storing the young mind with accurate ideas, and of correcting the errors of the other senses, in their most imperfect state. It has therefore been calculated that the mind acquires more ideas in the three years succeeding birth, than in all the rest of life.

The extreme sensibility of the whole body proves, at the same time, the cause of numerous painful sensations, and of many of the cries of new born, children, so generally imputed to a sense of hunger, since they begin to smile, and to exhibit more pleasing sensations as the skin becomes more indurated, about five or six weeks after birth. But the sensibility of the skin to cold, is something moderated, by the deposit of an oleaginous fluid into its cellular substance, derived from the

surplus of thin nutriment, the activity of assimilating powers, and the perpetual sleep of infants, immediately after birth. This state of obesity differs so much from the solid fat of the other periods, that it is of a transient nature, disappearing in the space of three or four days illness, and returning in as short a time as it was lost, on the recovery of health.

The internal surfaces of the body, are still more irritable than the external one. The secretions of the alimentary organs are of consequence more abundant, and their contents more frequently evacuated, than at other ages. We likewise observe that children of this age, do not require one-third so much medicine as in adult years, to produce a similar effect upon the intestinal canal.

The organs of voluntary movement continue more deficient during the whole time of lactation, than the other parts of the system, which do not require the same habit of action, for their consolidation.

The *Bones* being soft and cartilaginous, could not resist curvature, if the muscles had much action, neither could they support the incumbent weight, for some time after birth, if the lower parts

of the body had not received a great increase of blood after the division of the chord; but in this way they grow faster than the superior ones; and soon after the child emancipates from the fluid nutriment of the mother's breast; the pelvis becomes wider, and the patella ossifies; the tarsal and heel bones enlarge, to form a broad foundation for standing, and firm points for the action of the muscles of progressive motion. They become whiter by the contraction of their vessels, and the addition of ossific matter, as years advance. Before seven years of age, many separate pieces of bone become united, and the fontanelle of the scull is completely ossified. But the ends of the long bones remain cartilaginous for many years afterwards.

The *Muscles*, soft, irritable, vascular, and red, become dryer, firmer, and paler, as years advance. Those of the lower extremities, which were lax, and without belly, acquire, by the appetites and perpetual motions of children, sufficient power to preserve the body in the standing posture, in the space of one year. The relative proportion of the superior parts of the body, at the same time decreasing, the tendency to the inverted position of the fœtus in the uterus, is counteracted by the

abundant supply of osseous matter, and muscular power, to the lower extremities: which enable children to support the head and the viscera of the abdomen before the centre of gravity, without the risk of falling, and furnishes them with the means of walking before two years of age.

The *Glands* of the Lymphatic System are more numerous, large, and turgid, in early infancy, than at any other time of life; while all the other glands, except the liver and thymus, are small, in proportion to the bulk of the body. The glands of the mesentery, and the lacteal vessels, of greatest importance for nutrition, are particularly large during the whole period; but the liver, thymus, and renal glands gradually lose their relative bulk. The right lobe of the liver preserves nearly the same size as in the fœtus, for some time after birth; but the left lobe, deprived of the blood of the umbilical vein, loses bulk, and is said by a celebrated anatomist, actually to retract something, and to weigh less after birth than it did in the eighth month of pregnancy*. However that may be, we know that the liver gradually acquires a more just proportion as the other parts of the abdomen increase, so that

* Portal D'Anatomie Medicale.

its lower margin, which is extended to the navel at birth, is hid under the ribs of the right side in adult years. The compression of the abdominal muscles and diaphragm, together with the different distensions of the stomach, accelerate the sluggish circulation of blood in the porta, and render the bile, which was inconsiderable in the fœtus, extremely copious after respiration has commenced, although that secretion continues inert in its properties for a length of time after birth.

The *Heart and Arteries* being at the period of birth, large and irritable, in proportion to the bulk of the body, the pulse beats between 130 and 140 strokes every minute, and decreases gradually to between 80 and 100, at three years of age; but in fevers it will mount up to 160, and at times to 170, when its pulsations are so frequent that it can no longer be counted. This larger portion of blood, sent through the heart in a given time, increases the secretions from the glands, necessary for the growth of the body; and as the irritability of the whole system gradually diminishes, together with the relative size of the heart, the secretions in general become less abundant, and many of them are dried up in the contracted state of the glandular system in old age.

The *Brain* is soft, large, and fills the capacious cranium of infants more completely than at any other period; and its inequalities, which were hardly discoverable at birth, become gradually more conspicuous, as the brain indurates and contracts its substance by age. But the nervous system in the first part of life, is still of so fluid and weak a structure, that we find the brain, divided with the knife, can hardly sustain its form. Hence the reason, perhaps, that children are so prone to sleep.

These changes are not confined to the corporeal parts alone: the *Mind* expands with as much rapidity, as the body. We find the attention of children, after the first year, closely fixed on objects near them; they learn the names of things, and are capable of distinguishing their accustomed friends from strangers; and the progress of mental faculties advances so rapidly afterwards, that they are able to speak before three years of age. The numerous perceptions communicated to the mind in the beginning of infancy, very quickly vanish; but as the memory increases its strength gradually, together with the acquirement of ideas, children receive astonishing powers of retention after five years of age. It cannot, therefore, be a commendable practice to restrain their im-

pulsive curiosity, and their propensity to handle objects, which is a law of nature, peculiar to the age, on purpose to store the young mind with an accurate collection of ideas. The powers of imitation are likewise extremely great, after five years of age, which renders a judicious selection of associates, and the exemplary conduct of parents and instructors, circumstances of no small importance, as the period advances, when rapid changes are taking place in the state of the brain.

As the energies of the brain are increasing the proportion of sleep gradually declines through the journey of life, and upon the arrival of the second infancy, it terminates in general torpor.

The *Nerves* are so large and succulent in infancy, as to resemble medullary pulps; but they diminish in relative size, and grow dryer in their substance, and firmer in their coats, as years advance. The whole nervous system possesses so much irritability, that titillation, particularly of the sides of the body and soles of the feet, will throw many children into convulsions. But their sensations are not so durable as in the firmer periods of life, since sensibility and mobility seldom exist separately. By this condition of the nervous system, the irritability of the

muscular fibre is rendered so acute, that stimulants have very powerful effects on the body.

The *Eyes* are open at birth, but require change of structure, as well as the habit of action, to render vision distinct. The sight is so incomplete in children newly born, that they move their eyes in opposite directions, and turn them towards the most dazzling light, with a degree of eagerness, at the very time their pupils are in the greatest state of dilatation; but this imperfection is greatly owing to the reddish and turbid state of the humours in the incipient functions of the organ, intended, most probably, to guard the delicate expansion of the optic nerve from the intensity of the new stimulus for a few weeks after birth. The colour of their eyes is oftener blue than hazle; but they generally darken with the skin and hair, by age. They are nearly as large as in adults, and thus harmonizing with the plump and smooth features, unimpressed with the passions, they render the innocent smiling faces of children under three years of age, not less captivating than the brilliant lustre of eyes, and vivacity of countenance, so conspicuous in females after the age of puberty.

The *Ears* are incomplete at birth from the

cartilaginous state of the meatus, in which the tympanum is situated; at the same time the mucous membrane covering the drum, for the protection of the internal ear against forcible impulses, not having yet become deciduous, children continue a considerable time after birth insensible to lenient sounds, and are pleased with noisy ones.

The *Organ of Smell* is so delicate in its structure, that the sense would be extremely acute, if it were not for the confinement of the nasal openings, and the deficiency in the bony sinuses.

The SECOND EPOCH of this period, the *Pueritia* of the ancients, between the seventh year and puberty, is the healthiest of all the terms of life. The living principle is remarkably strong, and the body in perpetual action. The digestion, therefore, receiving improvement from exercise, becomes stronger in proportion to the bulk of the body, than at any other age, and the intestinal canal naturally five or six times the length of the body, is relatively longer in infancy than in adult years.

The only remarkable evolution of the Second Epoch is the shedding of the teeth, which takes place at its commencement. The first set are so quickly formed, and so incomplete, that the hu-

man species, as well as all infant animals possessing teeth, require a second set, more numerous and better suited to the adult jaws. The pulps, therefore, of the permanent teeth, concealed in the jaws, behind those that are to be shed, begin their ossification a year or two after birth, by successive layers forming within each other, until they become so hard and solid, as at length to admit only vessels and nerves at their roots.

After this protracted growth, they appear above the gums in succession, at about seven years of age. By producing absorption they displace the whole of the first set, and an equal number of new ones take their place, nearly in the same order as the first set. To these twenty are added four more grinders to each jaw, which, with four dentes sapientiæ at twenty years of age, the second dentition of thirty-two adult teeth, is completed without the irritation, and constitutional sympathy, attending the first dentition.

The fluid brain insusceptible at first of vivid impressions, arrives at such a state of firmness, after seven years of age, as to receive and retain ideas with a force equal to that of any part of life, provided the attention can be properly fixed upon objects.

CHAP. III.

PROGRESSIVE CHANGES OF THE BODY IN YOUTH.

THE Juvenile period, between the fourteenth and twenty-eighth year, undergoes the most important changes of the whole of life, since all the former ones are only preparatory for the sexual evolution, and for completing the growth of the body*. Although there still prevails greater fluidity of structure at this age than in the meridian of life, yet a decrease of fluidity, and of irritability, distinguishes this from the former period.

* Youth is likewise defined, in Dr. Johnson's Dictionary, to be that part of life which precedes manhood, or the time between the fourteenth and twenty-eighth year.

In the FIRST EPOCH, the *Adolescentia* of the ancients, which we date from the fourteenth year, more rapid changes of body take place, than at any other age after birth. The body at puberty undergoes a general change of form in less than two years, and acquires a greater resemblance to that of the parents, accompanied, at the same time, with a sudden change in the state of mind. The keen appetite, strong assimilating powers, and sound sleep of this age, produce a superabundance of nutrition, to complete the different organs necessary for the grand scheme of mortal succession.

The head, thorax, and lower extremities are completed nearly in the order in which they were formed in embryo. Hence, the perfect consolidation of the brain and vital organs, not only augments the perfection of the lower parts of the body, but increases the general vigour, and the activity of the animal powers. The differences of the sexes which chiefly depended upon education and habits, are now distinctly marked by a new order of movements, originating, as it were, from central impulse.

In *Males*, when the seminal secretion commences, about fifteen years of age, the system, with new sensations, assumes new powers, both

corporeal and mental. The body having nearly arrived at its acmé, the growing process begins to take a new direction. The countenance becomes impressed and animated, hair appears upon the chin, arm-pits, and pubis, of a different kind from the former down of the skin. The glottis receives sudden increase in width and length, the thorax expands, and the lungs enlarge, so that both the force and modulation of the voice are augmented, since it passes from a sharp to a deep tone, in little more than one year. The genital organs are evolved, and the lower extremities become firm and muscular.

But men that live sparingly, or in cold climates, arrive at these changes later than those who live luxuriously, or in tropical climates. And children made eunuchs, undergo none of these changes, but acquire a tendency to corpulency. The whole frame continues weak, the beard downy, the shoulders narrow, the voice effeminate, the knees feeble, and the legs with small calves, from want of the genital stimulus, to promote the perfect development of the system. A similar imperfection occurs from congenital defect, since many men partake of the feminine character, by having the testes uncommonly small, or improperly formed.

Females arrive at puberty a year or two earlier than males, as the latter are of larger size, of stronger make, and possess thicker bones. Between thirteen and sixteen years of age girls begin to assume a graceful form, an animated countenance, and brilliancy of eyes, which express lively emotions of soul. Both the organs of the body and powers of the mind, acquire a high state of perfection, accompanied with a tendency to branch forth into new individuals. General plethora distends the inequalities of the muscles and cellular membrane with fat, so as to give a beautiful roundness to the organization. The bony cavity of the thorax at the same time expands, and the glands of the breast swell. New functions arise in the uterine system, with which all the parts of the body sympathize; and turgescence takes place in the breasts possessed of many nerves, which were of no use in former life.

The female voice naturally weaker than that of the male, from the aperture of the glottis corresponding to the smaller size of the larynx, is also a little changed at puberty, but the glottis which increases in males to double its size, does not increase its infant capacity more than a fourth part in females. This state of the

larynx, together with the induration of its ligaments and cartilages, render the human voice the most perfect of all musical instruments; but its parts are so nicely adjusted, and its structure of so delicate a nature, that neither very young nor old people are capable of singing well; and the whole term of human life is scarcely sufficient to learn the complicated movements of the numerous muscles of the chest, throat, and mouth, that might be brought into use in singing, or even in speaking, as we perceive from ventriloquists, who require the practice of many years to obtain a proficiency in the art*.

The capacity of the pelvis, and width of the haunches increasing at this age, give the lower extremities an oblique position. The viscera of the pelvis, which continued unchanged during the whole of infancy, become turgid with

* This modulation of sound does not proceed from the stomach, but from a strong inspiration distending the lungs, so as to swell the epigastric region, the person then depresses the epiglottis with the base of the tongue, or produces a slow and gradual expiration, modified with so much dexterity, that Mr. Fitzjames, at Paris, passed with rapidity to five or six different voices, imitating an animated dispute as if among persons at different distances, in a popular assembly. Richerand's Physiology, p. 376, 1807.

blood, the ovaries florid; the uterus large and round, with its cervix projecting.* At length swelled feet and pain of the loins, announce a sanguineous effusion, from the serpentine branches of the aorta, which open into the uterus and vagina, and a monthly habit of returning plethora establishes itself, and continues the greatest part of life independent of every means of depletion. But these changes do not take place exactly at the same age, in females of all countries, they commence about eleven or twelve in the East Indies, between thirteen and sixteen in Britain, and at about twenty in the cold regions of Lapland. The sooner they commence the sooner fecundity ceases, as their whole term seldom exceeds thirty years in any climate.

The evolutions of puberty are scarcely finished before the vertebral column, and the bones of the lower extremities, acquire a considerable degree of elongation. The spine, which has its intermediate cartilages soft and yielding, in the early and moist states of the body, elongates so rapidly, that it would constitute almost half the adult stature if it did not, at the same time, become more arched before twenty years

of age. The height of the body is further augmented by the relative growth of the lower extremities. They were only four-ninth parts of the length of the whole skeleton, and not longer than the superior ones, at birth, but become equal to half the ordinary stature towards the twentieth year. The author has frequently seen young people, expected to be dwarfs, increase their stature with astonishing rapidity, immediately before the time of full growth, by the elongation of the lower extremities.

Men, in this country, arrive at the medium standard of five feet six, to five feet eight inches, between the twentieth and twenty-second year. Women acquire a stature of five feet two, to five feet five inches, between the eighteenth and twentieth year, and this difference of time may occasion the difference of two or three inches in the stature of the sexes, or probably the more early termination of growth in females, is influenced by the monthly periods.

Premature growth is extremely dangerous to youth of both sexes; the disproportion between density and size, renders their organs feeble, and sometimes cuts short the thread of life. Very tall persons are also liable to acquire a habit of stooping, and those of short stature to become corpulent, both of which are apt to impede res-

piration. But the difference of height is of less importance, when it arises from the extremities, than when it depends upon the trunk of the body, since dwarfs, who possess large and well formed viscera, have generally great bodily strength, and persons with crooked or short legs, live to great age, if the trunk of the body be properly formed.

There is a natural difference among mankind, of a foot above and below the ordinary stature, which has been differently explained by authors. The Laplanders and Calmuc Tartars seldom exceed four feet four inches in height, which diminutive size has been ascribed to the condensing powers of cold, and the starving diet of Northern nations. It does not, however, appear, that human stature is so much connected with heat of climate as it is with hereditary disposition, and food. Europeans are taller than the natives of the rest of the world, a few South American Patagonians excepted *. And from analogy of grazing animals, which enlarge their osseous outline, as well as the

* Commodore Byron's Voyages represent these men to be a tall race, from eight to more than nine feet high, and the women from seven and a half to eight feet, at the Streights of Magellan.

bulk of their flesh, in rich pastures, we have reason to believe that the bones are susceptible of augmentation, beyond their common growth, by superabundance of food, particularly in the earlier periods of life, and that the increase may be rendered hereditary in a number of generations.

The general difference of stature in people of the same country, is chiefly to be ascribed to matrimonial connection, which, by a law of nature, approximates the offspring to the medium height between the two parents. But like other hereditary peculiarities, children often inherit their stature from one of the parents, in preference to the other, and family size will, in some instances, pass by one generation, and appear in the next. It was long ago observed, that some of the clans of men possessing the same name in the Highlands of Scotland, were all tall men, while the greater number of the other clans were remarkably short, which difference must have been of an hereditary nature. Perhaps one of the causes of the uniform short stature among the inhabitants of cold mountainous situations, may be owing to their seldom crossing their breed with those of other countries, to improve the size of their descend-

ants. A patriotic feeling inclines men to prefer the place of their nativity to all others, and more so in proportion to its natural sterility, and the prevailing ideas of beauty, founded on an association of ideas not easily broken, incline men to prefer females of their own country to those of all others. These appear to be the principal means of preserving uniformity of stature, in all large divisions of the globe.

A few individual dwarfs and giants, found in most countries, who do not produce races like themselves, must be considered as rare and incidental deviations of nature from her perfect standard. The many dwarfs on record, from half to a third of the usual stature, generally have an over-proportioned head, and deformed arms; and giants seldom possess thickness proportioned to their height. Most of those exhibited publicly, between seven and nine feet high, have been remarked not to live so long as their compatriots, because the strength and cohesion of their structure do not increase, in relative proportion with the magnitude of their body. But the living principle ever tending to the due formation of organs, and to the perfecting of a machine intended to govern the world, has preserved the stature of mankind nearly the same in all ages. We, therefore, find the general size of

the living inhabitants of every country little different from that of the aborigines; and the mummies of Egypt are found of the same stature as the present natives of that country.

In the SECOND EPOCH of youth, the *Juventus* of the ancients, which we date from the twenty-first year, the longitudinal growth of the body is entirely completed; the bones, the great outline of the machine, acquire their perfect length and appropriate consolidation, before twenty-two years of age, in men, and rather sooner in women: Buffon is, therefore, incorrect in stating, that longitudinal growth finishes in the 16th or 18th year, which seems to be an opinion formed in support of an hypothesis, that the length of life is equal to seven times the period of growth.

he body having now completed its minority, it receives the name of an adult, from medical writers; and the wisdom-teeth generally make their appearance early in this epoch. These four grinders, although rather smaller than the others, can scarcely find room sufficient in the jaws to make their appearance; and being naturally weak and imperfect bones, they, for the most part begin to decay soon after

they rise above the gums. All those bones which were least perfect at birth, are the last finished at this age, and like other parts formed late in life, are most prone to disease: but these hard bodies still continue in a state of permutation, after the time of longitudinal growth has ceased, since an increase of thickness immediately succeeds their elongation, independent of the constant absorption and deposition of matter going on through the whole of life, and so very perceptible in the orbits of the eyes, which indicate the age of animals better than any other external part of the bony fabric.

Lateral growth immediately follows the longitudinal one: the superabundant nutriment taking a new direction by the lateral and anastomosing vessels, the body extends in breadth during the whole of the epoch. In *Males* the bones become thick, the joints strong, the shoulders broad, the muscles of the legs bellied, and they continue to augment in size till near the thirty-sixth year; we may then pronounce the body to have acquired its greatest strength and symmetry, and men to have arrived at the meridian of life. In *Females*, the haunches and

lower extremities enlarge, the various parts of the body become round, and the whole frame acquires its most complete form, a few years earlier than in males.

CHAP. IV.

PROGRESSIVE CHANGES OF THE BODY IN MANHOOD.

THIS steady period, from the 28th to the 57th year, is the most perfect part of life, both with respect to corporeal and mental functions. But in some cases of extraordinary longevity, it is protracted to twice the length mentioned, in consequence of an uncommon sound condition of stamina, derived from the former periods, and a greater degree of attention paid to the state of the health in this one. The arterial system having diminished its area, in relation to the size of the venous system, and the solids and fluids having arrived at a due balance with each other, the period is not accompanied

with any remarkable changes of structure, until it approaches its close, when the slower circulation, condensation of solids, and decrease of fluids begin to interrupt the most perfect action of the organs.

The FIRST EPOCH, called by the ancients *Ætas Virilis*, we date from the twenty-eighth year. The body is now so nearly stationary, that five or six years, which made great alterations of persons in other ages, have little effect upon their appearance in this. It is, therefore, with propriety called the *Meridian* of life, since the faculties of both the body and mind continue a considerable time in their greatest splendour, and highest degree of strength. The solids are firm, the bony fabric complete, the circulatory system strong, the nervous system vigorous, and the mind active. The only remarkable change of the first epoch is, a deposition of the superabundant nutriment into the cellular texture, which succeeds to lateral growth, in a great many instances of grown people.

Sebaceous matter, always more or less fluid in the heat of the body, is secreted more abundantly from the minute vessels of the cellular substance in some periods of life, than others, and acquires a more dense consistence, and

change of colour, by increase of years. It resembles a liquid mucus in the fœtus; and a reddish coloured oil, immediately after birth. At two or three years of age, it becomes more dense and white, and gives the external form of the body a smoothness, and a beautiful round appearance. But, during the most active part of infancy, it diminishes in relative quantity, and collects again about the age of puberty. In manhood, it is first diffused over the body, and afterwards accumulated in great abundance, and of a more yellow colour, among the abdominal viscera. In old age, like the other component parts of the body, it becomes solid and dry; and towards the end of natural life, disappears altogether. In fact, it is a convenient deposit into the grand reservoir of cellular membrane, of a nutritive matter, ready to be absorbed into the blood, according to the exigencies of the system in its various situations.

In manhood, fat is not only accumulated in the cellular tissue of the skin, interstices of the muscles, and glands of the female breast, but it is also deposited internally, in the layers of the omentum, near the kidneys, and on the base of the heart. We therefore find corpulency steal imperceptibly on most men, between the ages of thirty and fifty-seven. In many instances

the belly becomes prominent, and the person acquires a more upright gait. But a moderate degree of obesity is certainly a desirable state of body at all times, as it indicates a healthy condition of the assimilating powers; and it is a law of the constitution, for its tone to depend upon the firm adhesion of the skin to the parts beneath. The cutaneous fibres loosely interwoven, admit of great enlargement in all directions, from distension of the parts underneath; and both the skin and cellular membrane possess a contractile power, while their circulation is entire in the meridian of life, as we perceive from pregnancy and dropsy; but in old age the waste of cellular membrane, and a flabby state of the cutaneous surface, are among the principal causes of the debility of the period.

Corpulency is generally accompanied with a healthy action of the assimilating organs, which improves the appearance of the body, by filling up the hollows of the skin. It also diminishes the irritability of the system, since fat people are remarked for good humour, and for bearing cold better than those who are lean, on account of the defensive coat of fat surrounding their nerves. Hence the converse state of the body did not escape the observation of the immortal Shakespear, who made the desperadoes of his

plays lean, and of an anxious and wakeful character; but when the heart and great vessels are so oppressed with fat, as to render the pulse slow and feeble, and the respiration difficult, the cumbrous load becomes of more serious import to the health, than is generally imagined.

The *Diversity* of human structure is more boldly marked at this, than at any other age, on account of the most perfect state of the body, and the impressions it has received from habits, and situation.

The differences of *Temperament*, which were scarcely observable at puberty, become conspicuous in adult years although they are by no means so well marked in our times, as they were in those of the ancients. The free intercourse of nations with each other, has so diversified European constitutions, as to render it impossible to reduce the temperaments of this day to a regular system, although there can be no doubt, but that primitive states of the stamina, particularly with respect to density and sensibility, distinguish individual men, by external signs, and subject them to specific diseases.

The *Sanguine* temperament, from superabundant fluidity, and delicacy of habit, manifests itself very generally, by a peculiar softness of

solids, fair complexion, light hair, quick pulse, and free secretions. Such a state of the body is usually accompanied with a lively, volatile, and impetuous mind, and with a disposition to vascular diseases, inflammations, scrofula, hæmorrhages, &c.

The *Melancholic* temperament, the reverse of the former, consists of dry, firm solids, accompanied with a swarthy complexion, dark or black hair, and slow circulation. Hence the vital actions are slow, the secretions sluggish, the mind deliberate, capacious, and frequently gloomy. The diseases are mostly dispepsia, hypochondriasis, mania, gout, &c. These opposite conditions of habit prevail, not only in particular individuals through life, but they succeed each other more or less in all men, since the lax fibre, quick circulation, florid colour, and sanguine mind of youth, are followed by the rigid fibre, slow circulation, dark complexion, and cautious gravity of old age.

The choleric and phlegmatic temperaments, likewise described by the ancients, can only be considered as varieties of the prior leading ones; and several new ones, lately described by the names of nervous, bilious, and lymphatic, are states of the body, varied by the habits of society, colonial intercourse, &c.

Idiosyncrasies are not, like temperaments, known by external characters, or particular states of mind, although they give rise to a diversity in the symptoms of diseases, and modes of treating them. Specific antipathies to the smell of musk, cheese, or a cat, which so often occur in delicate habits, are not more remarkable operations of an exalted nervous sensibility, than those of an anxious mind exciting paroxisms of gout, terror producing diarrhea, or animal magnetism bringing on convulsive fits. The most singular case of idiosyncrasy the author has met with, was in a lady aged about forty-five, of a thin nervous habit, who brought him a letter from a physician of Yarmouth, saying, she could not bear the twentieth part of a grain of opium, nor the eighth part of a grain of calomel, without exciting violent commotions in her constitution. It accordingly turned out, that she became irritable and ill, from having taken only three drops of laudanum, going to bed, although it was without her knowledge; and when she drank only a single wine glass full of Cheltenham water, it operated as powerfully upon her bowels as a pint would on those of other people.

But we, likewise, frequently find other kinds of idiosyncrasies, less under the influence of the nervous system, which are still more difficult to account

for than the former. That one person should be affected by contagion and not another, although placed in a similar situation, that particular plants should poison certain animals only, and that some foods should disagree with particular persons and not with others, must arise from some hidden peculiarities of structure, too minute to become objects of our senses; since the irritating properties of bodies are merely relative to the state of the organs, upon which the impression is made.

Besides the varieties of constitution prevailing among individuals, the diversities observable among the *Races of men,* distributed over the globe, require particular notice, as part of the history of the structure of the body in this period, although it may not immediately lead to conclusive opinions respecting age.

The three sons of Noah extended their branches so widely over the face of the earth, as to raise doubts among their descendants, concerning the unity of the parent stock; but the Mosaic account of the origin of mankind has received such ample confirmation, that most philosophers consider geographical situation as capable of changing the external appearances of the human body, as well as of influencing the duration of its na-

tural existence. Men, animals, and plants, alike confess the powers of climate and food, particularly on the exterior parts of their body.

There is but one species of human being, although the varieties are very numerous. It has, however, been objected to this unity, that there are differences in the bony fabric of men, as well as the many external dissimilarities which are familiar to common observation; and the preparations of Mr. Hunter's museum have been quoted in proof of this. But a gradation of sculls, from the lowest vertebral animal to the human Negro, and from that to the most perfect European, does not prove a difference of the species. The shape of the heads of the different tribes of Negroes differ from each other, as much as those of Europeans respectively, and a classification on this principle would make the number of species enormous, beyond all conception. The distinguishing characters of the species, can only be taken from internal structure, which is nearly the same in all men, however much their exterior parts may be changed by the influence of physical causes*.

* Diversities of colour and form in the species of animals and plants, depend upon climate, and the process of assimilation. Climate has the most power over the colour, and the food over the general prototype; but both of them operate

It is universally admitted, that the epidermis covering the skin of the human body, is a transparent membrane, which readily shews the colour

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powerfully upon the exterior parts of individuals, while the internal organization continues nearly the same in all the species. This is the reason that animals which have the choice of different kinds of food, and possess the means of defending themselves against the influeuce of the weather, are less subject to diversity of character than vegetables, and that man is still less so than either quadrupeds or plants.

Among quadrupeds, the effects of *Food* are particularly conspicuous with those which are herbaceous. The fat and muscles, and even the bony fabric, are diversified by the quantity and quality of their aliment. The enormous bulk of the ox in the luxurious pastures of Lincolnshire, and the diminutive size of black cattle on the barren mountains of northern countries, demonstrate the effects of food upon their bodies.

In like manner extremes of *climate* change the exterior coverings, and the form of animals. The author had occasion to observe the following alterations in a full grown sheep. It was lank and covered with hair in Jamaica, and on being removed to the cold winter of New York in America, in less than four months it became fat, and copiously covered with wool. But again arriving at Antigua in the West Indies, it assumed, in less than a quarter of a year, the hairy covering, and lank appearance it originally possessed, although there was little difference in the nature of the diet during these changes, as the animal was almost all the time on board ship. It more probably arose from the greater growth of the hairy filaments by heat.

of the parts beneath; the inorganic mucus, therefore, that connects it with the true skin, suffering condensation and change of colour, by various external causes, proves the principal origin of the variety of complexions we perceive in the differ-

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However little impression these causes may make upon the adult form of animals in the first generation, the diversity is greatly increased, by the continued application of the same causes, in the growing period of the second, and it is often perpetuated with established force in the third. But the greatest difference of shades in animals, takes place from promiscuous intercourse of sexes, particularly among those species which change the male oftenest, and have the greatest number of births. Thus dogs have lost all resemblance of their original species, and breeds of sheep which had four horns in the wild state, are now perpetuated without any. These varieties, however, are far from being essential, and every animal has preserved its specific characteristics since the creation of the world. This is owing to the restraining laws of nature, which prevent animals of different species from cohabiting together, and to the activity of the living principle, which restores depraved structures to their original standard, or permits them to be destroyed by disease. Hence it has been observed by the celebrated Buffon, that the mules of the sheep and goat, return to the character of the species in the first generation, and those of horse and ass, in the third and fourth.

Variations of structure in *Plants*, which conceal the characters of species, are more frequent than in animals, but they are wholly incidental, and extremely changeable. The distinctive characters of their species, taken from their

ent races of men. Of all causes, which alter the state of this mucous substance, the reflected rays of a vertical sun are the most powerful. They most probably occasion the vessels to pour into it a colouring matter, since they darken and thicken the mucus of the skin, frizzle its other appendage the hair, and in conjunction with particular habits of life, alter the features of the face. Thus we find the gradations in the colour of the complexion, from white to swarthy, olive, tawny, and black, nearly in proportion to the situation of men between the poles and the equator. We can even discover the colour of the skin to deepen, as we proceed from England through France, Spain, and Barbary.

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root, stem, foliage, and fructification, cannot be altered by culture or climate, like the varieties of colour, taste, and smell, which are more exterior qualities. But the latter become at times so greatly diversified, that in order to determine the species to which they belong, it is necessary to revert to the invariable properties of the seed, by a new propagation. All their unnatural varieties, however, are liable to become diseased, or to be effaced by the vital power of the plant, in no great length of time; and these correctives, together with the natural sterility of hybrids, preserve the species, and limit the varieties of the vegetable kingdom. But as whole classes of plants generate prolific hybrids, the speceis do not continue so entire as those in the animal kingdom, owing to the greater barrenness of mule animals.

But the skin of the *Negro* has acquired a colour as black as jet, accompanied with short frizzly hair, and savage features, from certain habits peculiar to the country he lives in, and from the continued operation of intense heat on the naked surface of the body, during a great number of centuries. The *Moors*, expelled from Spain to the coast of Barbary, have acquired in two centuries only, a colour as dark as that of the Mulattoes in the West Indies, accompanied with more savage features, in consequence of certain modes of living upon a tract of country between Senegal and Abyssinia, in the burning regions of Africa*. All negroes have been orginally derived from the torrid zone; but black is not the only indigenous colour between the tropics. The locality of high mountains, sandy deserts, thick forests, bleak winds, and copious exhalations, frequently occasion a difference of fifteen or twenty degrees of climate, which diversify men living in the same region, under a vertical sun.

The mixed breed of the human species, called *People of Colour* in the West Indies, cannot be considered as nations of native men, since they spring from the union of white and black parents, in all countries alike. Neither can the peculiarities of the *Albinoes* of Africa, the *Cagots* of the

* Mr. Mungo Park's Travels in Africa.

Pyrenees, nor the *Cretins* of the Valais, be otherwise estimated, than as diseased appearances of scrofulous individuals, which are incidental to particular unhealthy situations of different countries.

White is the only native colour of the temperate zones, and appears to be the primitive complexion of the human species, as it still prevails over the world. It, however, suffers an occasional degeneracy of colour, from the operation of physical causes, in the most temperate regions. Thus the wandering gypsies acquire a swarthy colour, from their dirty habits, and constant exposure to the tanning powers of the weather. Even the laborious poor of England are more of an adust complexion, than the higher orders, who feed delicately, and fade like plants excluded from the influence of air, and solar beams. Moral as well as physical causes operate on the cutaneous surface. Thus it is matter of common observation, that predominant passions make deep and lasting impressions upon the human visage; inactive mind produces vacancy of countenance; and the blessings of a free government, a comfortable means of subsistence, and an exemption from controul, impress the face with regular features, and give it an animated and sensible appearance.

The influence of physical causes is also parti-

cularly marked in the dark skin, and deformed features, peculiar to the inhabitants near the Poles, owing, in great measure, to the intensity of their cold. Thus the union of a rigorous climate, with unwholesome food and dirty habits, render the skin of the Laplanders and Calmuc Tartars *brown*, and their features ugly; while the sudden changes of a severe climate, and the barbarous customs of the indigenous Americans, render their skin *red*, and their features extremely wild*.

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* The external characters, distinguishing the different races of native men, are the following:

NORTHERN REGIONS. Laplanders, Esquimaux of Labrador, and Tartars of Siberia. *Stature*, from 4 feet to 4½. *Body* squat and robust, with short legs. *Head* broad, with a flat scull. *Colour*, brown and tawny. *Eyes* small and sunk, with thick eyebrows. *Hair* straight and black. *Features* flat, with elevated cheek-bones. *Mouth* large, with thick lips. *Countenance* dull and vacant, and a shrill *Voice*.

MIDDLE REGIONS. Arminians, Circassians, Greeks, and Europeans. *Stature* from 5½ to 6 feet. *Body* various, generally well made. *Head* spherical, with an arched forehead. *Colour* white or sallow. *Eyes* blue or hazle. *Hair* mostly fair and long, with strong beards. *Features* handsome, projecting nose, with small mouth. *Countenance* variable and animated.

ASIATIC REGIONS. Hindoos and East Indians generally. *Stature* from 5¼ to 5¾. *Body* delicate, well made, and ge-

In the SECOND EPOCH of manhood, which we date from the 45th year, the body begins to retrograde. It was hence called by the ancients *Crudum senium*, or green old age, to distinguish it from actual old age.

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nerally with small legs. *Colour* olive. In *Madras* under middle height, thin, active, and nearly black. In *Bombay* medium height, and strong. In *Bengal* near 6 feet high, handsome, and olive colour. *Chinese* broad plump faces, corpulent, small black eyes, and swarthy complexion. East Indians in general *Eyes* black. *Hair* black and long. *Features* handsome, with projecting nose, and well-formed mouth. *Countenance*, patient and grave.

ÆQUATORIAL REGIONS. Africans, Hottentots, and West India Negroes. *Stature* from 5½ to 5¾ feet high. *Body* stout, muscular, with bowed shins, and strong perspiration. *Head* various shapes, mostly narrow before and large behind. *Colour* black. *Hottentots* stout, ill-shaped, and of Mulatto colour. *Moormen* fairer than the Aborigines. Negroes in general, *Eyes* black. *Hair* black, crisp, or woolly, with little beard. *Features* flat, with dilated nostrils, and large ears. *Lips* thick. *Countenance* animated, but in many instances vacant.

SOUTHERN HEMISPHERE. Indigenous Americans, from 5 to 5½ feet. *Body* strong and robust. *Peruvians* short and well made. *Canadians* tall and well made. In general, *Head* large, with round faces. *Colour* copper or red; but fairer in elevated situations. *Eyes* dark and small. *Hair* black, short, and lank. No beard. *Features* wild, with depressed nose and thick lips. *Countenance* fixed and stupid.

The human body now begins to die, in the same gradual manner in which it began to live. The general increase of density, which brought all its parts from atomic fluidity, to adult firmness, becomes at length too great for the most extensive and continued actions of life. It is, however obvious, that the failure of the system, from the secret operations of time, commences sooner in some organs than in others, as it depends very much upon the goodness of their original conformation, and the use that has been made of them through life. We already find the skin, constantly exposed to the action of external agents, has acquired greater toughness, and a darker hue by time : and the face is more strongly impressed with wrinkles from the absorption of the fat, and from the long continued action of the subcutaneous muscles. Movements also begin to be performed with greater difficulty, and a greater degree of stiffness is felt by many people in their lower extremities, more especially in the joints of their knees. The irritability of the muscles is diminished. So early as fifty years of age,

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PEOPLE OF COLOUR. *Whites*, with shades of the black. A Mulatto, a Quadroon, Musteze, and free white. A *Black* with a Mulatto, produces a Samboe; and with a Samboe a Quinteroon.

there may be observed in most men a greater disinclination to motion, and a sense of greater fatigue from exercise.

As the circulation of the blood becomes slower, a prominent belly takes place in numerous instances, before or soon after, the forty-fifth year. Some physiologists have considered this as the first symptom of decay, particularly as it is generally observed to continue through a great part of the period of old age. When it arises in fat people, it has a tendency to make them carry the superior parts of the body upright, in order more effectually to balance the head upon the centre of gravity. This protuberance very often arises in persons, without any other disposition to fatness, and must, therefore, be considered, as an oily deposit among the abdominal viscera, for the protection of the indurating organs late in life.

One of the earliest failures is distinctly marked, in the loss of tension in the delicate organ of vision, which occurs in the greatest part of mankind before fifty years of age. As the humours shrink, the cornea flattens a little, thereby diminishing the convexity of the globe, and occasioning the less distinct vision of objects in candle-light.* As soon as this commences, persons reading find it necessary to hold the book farther from

their eyes, that the luminous rays may be concentrated sooner into a focus, and to bring the candle nearer the face, that the quantity of light may be increased: but fortunately for mankind, this imperfection, called the presbytic state of the eye, is readily remedied by the use of convex lenses, one of the most useful and important of all human inventions. The eyes may thus be preserved to a very great age, by the gradual increase of their convexity, if at the same time the patient uses precautions against fatiguing the eyes, by over-exertion, which would be likely to induce diseases at these advanced years.

Before the period of old age, an evolution takes place in the generative system, but in a more gradual manner than that of puberty. The object of human succession accomplished, the procreative powers of the male begin to fail, from defect of tension in the external organs, in consequence of the contraction of arteries being greater than that of veins; and the defect is much increased as the mind loses confidence in the powers of the body.

But the failure of generative powers occurs sooner in females, in consequence of the diminished velocity of blood, and a general contraction of the uterine vessels. The periodical flux, therefore, ceases about the age of 48; the ova-

ries grow more firm and compact, and the appearance of ova in them is lost. The unimpregnated uterus, which, in adult years, had continued nearly of the same size, begins to lose its magnitude. It decreases at the cervix, and its body becomes round and pale, from the shortening of its minute vessels, and the contraction of their diameters. A corresponding decrease of size, and cessation of functions, take place in the breasts, and the system no longer able to produce or support an offspring, assumes an inordinate disposition to disease. Women no longer capable of becoming mothers, assume a tendency to approximate the constitution of the male sex. Sometimes their voice becomes rough, a beard grows on the chin, and the face acquires more of a masculine aspect.

CHAP. V.

PROGRESSIVE CHANGES OF THE BODY IN OLD AGE.

It might be expected, that the history of old age would commence with the incipient part of man's decay, which is felt in some of the organs soon after forty-five, but it would be considered as a perversion of language in these days, to call men old at the time the body begins to retrograde, in a manner known only to anatomists. The author is, therefore, inclined to designate the 57th year, when the failure becomes generally obvious over the system, as the beginning of old age, and, the 81st year, as the commencement of the age of decrepitude, which extends to any sub-

sequent number of years, to which the life of man may be extended.

The failure of the machine most persons are desirous of concealing. Men as well as women are adverse to the prospects of losing the enjoyment of life so soon, and are also afraid of exposing themselves to the neglect, which old people often experience, from the young, the gay, and the fashionable, who constitute the greater part of the community. But it is not less cruel than it is common, to use the epithet *old*, as a term of reproach to people advanced in years, since old age is the state to which most men endeavour to arrive, as a reward for the care they have taken to preserve their bodies through life. Besides, the natural infirmities of the period can only be supported, in many instances, by the power of habit, and ought, therefore, to be exempted from ridicule and reproach.

Age, on the contrary, ought to be venerated and respected, especially when we consider it free from the dominion of impetuous passions, and endowed with a greater share of experience than appertains to the other periods of life. Nay, we may advance another step, in deprecating the calumny too generally directed against the condition of the period, by observing, that when old age is devoid of unpleasant reflections from

the conduct of a past life, and of diseases from the imprudence of former years, men in easy circumstances, find it an extremely comfortable state.

In the FIRST EPOCH of old age, the *Senectus* of the ancients, which we date from the 57th year, rigidity begins to prevail, and the sensibility of the body to diminish. The changes, however, from lapse of years are so gradual, that many men are scarcely sensible of their own decay. They are apt to consider the differences they experience in their sensations, as a proof that human affairs are in a worse state than formerly, and therefore are apt to sound the praises of the good old times, in which they spent their early days.

The failure commences so much sooner in some men, than in others, that it is with difficulty we can discover the general plan, which nature pursues in her operations. Thus, the first failures are usually discovered in the flattening of the coats of the eye, and in the debility of the generative organs, which immediately succeeds, although many individuals retain the power of these organs, in a perfect state, beyond the age of sixty; and there are not wanting instances of men enjoying both their sight, and prolific powers, so late as eighty or a hundred. In some men the joints become stiff, and the body weak; in others

the urinary organs pass their secretion with difficulty, before the time we have designated for old age; whereas, in many cases, neither of these suffer any notable decay, until near the period of decrepitude. Some men begin to lose their memory before old age, and others approach the end of their century, with their mental faculties little impaired.

The body, however, begins to perish generally in almost all men in this country, about the age of fifty-seven. It loses the powers of renovating itself, as well as of generating other beings; and those parts of the body which had the greatest share of action, fail first, as may readily be discovered by all persons who have eat old animals at their table. But we must enter more particularly into the consideration of these phenomena, to discover the reason, why the food that nourished us through life, ceases to do so, and the debility of age and death uniformly supervene in the human species.

On taking a general view of the multifarious phenomena occurring in the period of decline, our attention is naturally directed to the deteriorated functions of the cutaneous surface; the changes in the circulation of the blood and secretions; the partial failures of mastication, sight,

hearing, urinary, pulmonary, and cerebral functions; the general decrease of motion from rigidity; and the supervening debility of the whole frame. These are the most prominent characters of the age, which we are now to consider.

The *External Surface* of the body, endowed with a greater share of vascularity and nervous sensibility, than other sentient parts, exhibits more distinctly than any other the changes of age. The laminæ of the inorganic cuticle, serving to protect the cutaneous structure, like slates upon a house, suffer no kind of alteration at any time, excepting a degree of thickening from pressure. But the subjacent mucus is altered by age, from the fluid and reddish state observable in infancy, to a condensed membrane of a dark colour, upon the arrival of old age. That the true skin, especially in these parts of the body constantly exposed to the atmosphere, undergoes very remarkable changes, appears, from comparing its present, with its past state at birth. It was at first a slender tissue of gelatinous fibres, soft, irritable and so transparent as to appear florid, from the number of arteries it contained. But in old age, it is found to be a tough, brown, and insensible tegument, in consequence of the contraction of its vessels, and condensation of its substance. It is even difficult

to penetrate the skin of old subjects with the dissecting needle.

It has, of course, lost so much of its contractile power, as to render it incapable of adapting itself to the waste of parts beneath, and therefore becomes wrinkled and flaccid, as well as hard. We can often detect the secret operations of time corrugating the skin of the hands and face, and converting the lineaments of the lower part of the countenance, slightly impressed by the passions, into dark coloured wrinkles, in the last epoch of manhood; but the transverse furrows, now forming on the forehead, more particularly characterize the period of old age.

The hair, an appendage of the skin, decays with the other parts of the surface. It becomes weak, grey, and at last deciduous, by losing its supply of cutaneous juices, and colouring matter, as well as by the contraction of its tubular part. At first, the summits of the temporal and occipital bones become bald, particularly in the male sex, and at length the general appearance of a hoary, and almost naked scalp, announce the arrival of a venerable age. The author has frequently seen the hair of the head assume a beautiful white, and silvery appearance, early in this period.

The cellular membrane under the skin, not only becomes condensed, but the same reticular sub-

stance proves the common cause of the induration of every part of the system, by age. As it invests every minute fibre of the body, and according to the opinion of the illustrious Haller, constitutes the basis of all the organs, their firmness and induration must depend upon its different states. The changes of the body in the fœtal state are greatly connected with its extensibility; of middle age, with its contractility; and of the latter part of life, with its rigidity and absorption. In short, all the remarkable changes of a living system, from age or disease, chiefly depend upon the cellular membrane.

This reticular substance, extremely abundant and fluid in the fœtus, diminishes in relative proportion, and increases in density, as the system developes. The watery exhalations and oily fluid, which moistened its cells in infancy and middle age, become so deficient in this period, as to augment the natural aridity, and rigidity of the organs; and it becomes at last so tendinous, and its cells so nearly obliterated, that the skin gets loose, and sometimes bags upon the body, towards the end of a long life. Hence it is, that the flaccid state of the skin in old people, becomes liable to echimosis, from the slightest contusions, and to severe itchings, which can hardly be allayed. But above all other distressing circumstances, the

disappearance of the cellular substance, at this period, is the worst, as it renders the body extremely sensible to cold, probably by the loss of its non-conducting powers of animal heat.

The *Circulation of the Blood* undergoes considerable changes in the advanced part of life, and the anatomist can trace the first decay of the body to this source. The *Arteries*, which were the first formed parts of the embryo, begin to lose power in the second epoch of manhood, and having increased in density through life, are found narrower in their diameters, and more rigid in their coats, in senescence, than they were in the former parts of life, and many of them soon afterwards become altogether impervious at their extremities. We observe two changes taking place at the same time in their coats. The cellular coat becomes denser, and the muscular one loses part of its irritability, which increase the fullness, and diminish the velocity, of the pulse. The author has frequently found the pulse of very old people, beating less than fifty strokes in a minute, and at the same time full and strong. At other times, when attended with long or frequent intermissions, it did not beat thirty in a minute which led him to suspect the existence of ossifications about the heart; but he afterwards considered the irregularity to have arisen solely from

diminished irritability of the heart and arteries, in several of those instances, since it became regular, as soon as fever, or other powerful causes, excited these organs to increased action. But above all other changes of the vessels, the first and most important ones are found in the capillary arteries, minutely distributed over the surface of the body. They begin to contract their diameters in early life, and to disappear in the commencement of this period, as we readily perceive by the state of the cutaneous surface, in the latter part of life.

The coats of the *Veins*, naturally thinner, and more firmly adherent to each other, than those of the arteries, neither thicken nor contract by age; on the contrary, they become thinner than before, and the cellular membrane, which connects their internal with their middle coat, being less abundant than in arteries, they do not suffer rigidity from its condensation, nor from the deposit of calcareous phosphate among its fibres, as is the case in the arterial system.

In this condition of the vessels, the balance of blood is thrown completely upon the venous system. The greater density, and diminished capacity of the arteries, favoured by the extensibility and languid circulation of the veins, in old age, fills the venous system with nearly two-thirds of

the whole mass of blood, which was equally divided between arteries and veins in the period of youth. Hence arises the frequent congestions, ruptures, varices, piles, and venous plethoræ at the decline of life, in the system of veins. But the most remarkable instance of an altered distribution of blood, is seen in the sub-cutaneous veins, which were scarcely visible in infancy, but which become large, prominent, and turgid, in the period of old age.

These changes in the system of vessels, likewise alter the condition of the *Secretions*, both with respect to their quantity and quality. Thus the decreased velocity of circulation, and the diminished area of arteries, not only lessen the proportion of secretions, but likewise render them impure. The contraction of the glands must of course diminish their secretions, which are always proportioned to their orifices. The lymphatic glands, large and turgid, in the growing period of life, become small and compact in adult years, and many of them obliterated or ossified in old age; hence, the principal reason of the marasmus which then takes place, from contraction of the glands of the mesentery.

The blood itself, as well as the fluids secreted from it, becomes darker coloured in this, than in

any former period. The diminished perspiration of the skin determines the blood to the lungs, and increases the fœtor of the breath: the urine becomes higher coloured, more odorous, and earthy: and the pituitory membrane is stimulated to involuntary discharges of tears, and to the mucous drop from the nose, so frequently observable in old people.

The particular functions, which, by an early failure, indicate old age, are chiefly the following:

Manducation becomes defective as the nutrition of the system declines. The teeth, formed rapidly in an advanced part of life, are the first bones that decay. The wisdom teeth are hardly discovered above the gums, before they are found carious. In manhood all these hard bodies decay in succession, first in one angle of the jaw, and then the other, where the pressure from manducation is greatest; and those which are rooted in the spongy substance of the upper jaw, go first. Those which act against an opposite set are first worn away, while those without opponents, frequently continue large, until late in life. And in old age they spontaneously drop out of the gums, from absorption of their sockets, so that few people retain any teeth at eighty years of age. The mouth then becomes smaller, by the chin

approaching the nose, and it can scarcely contain the tongue, which gives it the appearance of being too large for the cavity.

Vision declines gradually, and the greatest number of old people become blind before the end of a century, either from decay of the organ, or its diseases. The eyes, the mirrors of life, always indicate the depredations of age more unequivocally than the other organs of sense, on account of the various changes of their different parts. Not only the waste of aqueous humour, and the flattening of the cornea, which rendered glasses necessary in the latter part of manhood, increase by advance of years, but the loss of the globular appearance and vivacity of the eyes, which indicate age in all animals, as well as the human species, becomes very observable. 'The crystaline lens, of a fluid consistence, red colour, and of a spherical figure in the fœtus, increases its transparency, and becomes more solid and flat in infancy; continues stationary for a considerable time afterwards; and assumes a disposition to become yellow, or amber-coloured, in old age. But nature has favoured the period very remarkably, in one of the changes of this organ. The choroid coat of the eye, which in former parts of life, was covered with a black pigment, to prevent the rays of light from disturb-

ing distinct vision, as in a dioptric instrument, becomes so white in the advanced part of old age, by deficient secretion of its paint, as to enlighten the inner chamber of the eye, as in animals which feed in the night, and prevent total blindness taking place, when the retina is losing sensibility, so soon as it otherwise would do.

The *Hearing* fails with so little apparent change in the mechanism of the ear, that it is difficult to discover the nature of the disorganization, which gives rise to the deafness of old age. It is a subject little understood, but it may be readily conceived, that the rigidity of the delicate muscles and ligaments, of the chain of bones, conveying aerial undulations to the inner chamber of the ear, and the contraction of the eustachian tube, supplying the balance between the external and internal air, must have some effect upon the hearing. It, however, appears, from various dissections already made, that the fluid, filling the cavity which contains the expansion of the auditory nerve, wastes, and is found completely wanting in many instances of aged persons: the loss, therefore, of the natural moisture, and the failure of the nerve, appear to be the chief causes of the deafness which happens to near a third of the whole of mankind that arrive at extreme old age.

The *Urinary Functions*, constantly going on night and day, feel the effects of age early in the period. Many men, soon after fifty, begin to use greater force in passing their urine, and void it more frequently than before. The bladder, a muscular as well as a membranous bag, suffers induration and decay, like other muscular parts, but more particularly towards its neck, where the fibres contract to form a sphincter, and the debility of the bladder must naturally increase with the advance of the period. We, therefore, perceive sufficient causes for incontinence of urine, which occur so frequently in this period. Indeed it could never fail to distress every aged person, if nature had not made some provision against its involuntary flow. There is, therefore, a natural tendency in the prostrate gland to increase its magnitude, after sixty years of age. The diaphragm and abdominal muscles are of consequence called into more frequent actions every time the urine is expelled, from debility of the bladder, and enlargement of the prostrate gland, which, in earlier life, was completely voided in a continued stream, by one effort of these muscles only.

Although the enlargement of the prostrate gland towards the sides of the urinary canal, diminishes the facility of passing the urine, it is

seldom attended with pain, and is so common to the period, that it cannot be considered as a morbid state of the parts, in the first stages of its appearance; it is, however true, that when the enlargement becomes extensive, towards the anterior or posterior parts of the urethra, it will occasion distressing obstructions, and a preternatural sensibility of the bladder. Thus the posterior small lobe of that gland, next the rectum, is represented as forming a tumour, which at times has been found projecting an inch or two into the bladder, and produces obstructions by shutting up the mouth of the urethra; instances of which have been lately mentioned in the philosophical transactions by Mr. Home, and were formerly noticed by Morgagni*.

Most old people have frequent calls to void their urine, and few beyond seventy-five can retain it a whole night, however little their drink may be. The acrimonious properties of the urine are certainly greatly increased in these years; but some authors have explained the more frequent inclination to avoid it, by a diminished capacity of the bladder. Morgagni says, when

* Phil. Tran. vol. 96. part I. 1806, and Morgag. Ep. LXVI. A. 5.

the bladder becomes narrow, and little distensible from the rigidity of age, the urine will be made often, and little at a time. And an anatomist of great celebrity on the continent, says, the bladder is naturally smaller in adults than in earlier years, and still more so in old age*.

The *Pulmonary Functions* begin, for the most part, to fail early in the period. The lungs, which receive the whole mass of blood, are particularly sensible to its slower circulation, and to the change that takes place in its distribution after the meridian of life. They suffer a gradation of colour, from light brown in infants, to nearly black in old people. And a person at the time of senescence, soon becomes sensible of a difference in his functions of respiration, if he only runs a short distance. When we consider the increasing density in the branches of the pulmonary artery, the augmented rigidity in the rings of the trachea, the contraction of the bronchial cells, the failure of the muscles of respiration, and more especially, the unperspirable state of the skin, we cannot be surprized at the debility of the pulmonary organs, and the copious discharges

* Morgagni Ep. XLII. A. 35. Portal d'Anatomie, tom. V. P. 397.

which take place from the mucous glands of old people, particularly in cold and damp seasons.

Loss of memory is the first humiliating notice of a change in the *Cerebral Functions* by age. But in all such cases it is useful to recollect, that learning things over again, is generally conducive to happiness; and that memory often fails, when the judgment continues entire, and the other mental powers suffer little injury. The judgment, or habit of comparing ideas, always remains the longest. In senescence, old ideas begin to be less easily recalled, and with whatever force new ones may be impressed upon the sensorium, they are sooner effaced than those which were stored up in early years. But it is also true, that the memory in many instances of great age, is nearly obliterated, and consequently the other mental faculties suffer a proportionate failure. The author perfectly recollects two instances of men who entirely lost their memory at an early age. One was removed to the country, as he could not distinguish the room he generally inhabited from any other in the house, nor did he know one of his nearest relations from the other, although his sight was little impaired, and his strength and appetite were tolerably good. The other person likewise retained his appetite and sight, and walked about the streets with a keeper.

But his conversation was totally incoherent from the memory being nearly destroyed. Both these gentlemen lived several years afterwards in a state of mere animal existence, although neither of them had attained his eightieth year.

It is a singular fact, that the feelings of mind in old people are acute to the loss of friends and companions, although their sensations are blunted to general impressions. It has, therefore, been frequently remarked, that man and wife, advanced in years, soon follow each other to the silent tomb; and perhaps it may arise from the change of the survivor's situation more than from any diminished chances of life, since it is well known, that both the mind and body come more completely under the dominion of habit, the longer persons live after the meridian age.

Nature has proportioned the quantity of sleep to the necessity of nutrition at all ages, by a gradual change in the structure of the brain; hence arise the distressing states of wakefulness, experienced by persons of great age. Young children sleep sixteen hours of the twenty-four: the middle aged sleep about eight: and old people seldom sleep more than five or six hours in the night, and these are often disturbed by dreams. But notwithstanding the prevalence of this law, it is not without many exceptions, since sleep,

like other operations of a nervous system, depends much on habit. Some old persons sleep nearly as sound as those in the meridian of life. The wakefulness of this age is, in many instances, induced by indigestion, cold feet, and frequent inclination to void urine, which are affections common to the period.

The *General Decrease of Motion* from rigidity, is soonest observed in the organs of progressive movement, since they are subject to greatest pressure and action. The knees become stiff at an early period; the capsular ligaments, and articular cartilages of the other joints, as well as the intervertebral substance of the spine, become indurated soon afterwards, as we perceived by the loss of stature, and power of motion. The tendons, which at first were assemblages of red fibres, like the muscles, are so compacted by the actions of life, as in manhood scarcely to receive vessels and nerves. They lose their irritability long before the body of the muscle, and many of them become, at length, osseous, where they are attached to the bones. The muscles themselves suffer condensation, and some degree of diminution in their size. When we observe that their fibres, which are imperceptibly minute to the naked eye, are enveloped in a cellular sheath that forms their bond of union, and their different fas-

ciculi are covered with a cellular coat, while at the same time all their parts are supplied with blood vessels that contract, we can readily understand how an increase of induration, decrease of colour, and loss of tone, necessarily take place in the muscular system upon the arrival of old age.

Induration likewise destroys the sensibility of the nerves. Hence we perceive, that the external senses are blunted by age, the pia mater and blood vessels which accompany their medullary fibres, as well as the cellular tunic which invests the nerve, become hard, yellow, and more firmly attached to the medullary part, they must necessarily lose their influence over the muscular fibre in the latter part of life. They have, therefore, been beautifully compared by Portal to the branches of an old tree covered with moss.

These various changes in the organs are followed by a state of *General Debility* which hastens the body to its dissolution. The loss of the contractile power of the skin and cellular membrane, which they so greatly possessed when the circulation was free and active in the meridian of life; the decrease of nutrition, and the failure of moisture, from a languid and contracted circulation; the elasticity of arteries, muscles, and cartilages, destroyed by rigidity: and the nerves at

last impaired by induration, leave us no room for surprise at the debility which supervenes on old age. Old men totter, and fall to the ground from a very slight touch. They are, therefore, rendered cautious, walk slowly, with their lower extremities widely separated, and tread upon the entire soles of their feet, without rising upon their toes. The cartilages of the anterior part of the spine continuing in a compressed state, while the muscles of the back have lost their strength, the frail trunk bends towards the parent earth, which is always ready to receive the mortal part into her peaceful bosom*.

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* Nature pursues one general plan in the progress and destruction of life, for the purposes of succession, in both the organic kingdoms, although the particular mode she employs is frequently obscured by the remoteness of analogies, and by the rapid evolutions of many of the species. We can even trace old age arising in vegetable bodies, from the gradual induration of their different parts.

The *Seed* and *Bud* nearly fluid, and without any appearances of woody fibres, become hard and ligneous as the plant grows old. The *Bark* loses the green colour, and acquires a dark or brown one: its vessels contract by age; at length many of them become invisible. It possesses considerable powers of restoration in the plenitude of its vigour, as we perceive by the regeneration of lost bark in young trees, but it loses these powers in the decline of life.

In the SECOND EPOCH of old age, the *Decrepita Ætas* of the ancients, which we date from the beginning of the 81st year, the scene of mortal existence

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The Wood composed of alburnous rings of sap and air vessels, is at first yellow and soft, but becomes darker coloured, and harder in its structure, by age. The ligneous rings, likewise, decrease in breadth, and are less distinguishable from each other as the tree grows old. The *Pith* contracts its cellular structure, loses proportional bulk as the plant approaches maturity, and is often completely obliterated in old age. The *Leaves* grow rigid and yellow in Autumn, and diminish their number so much by age, as to interrupt the function of inspiration in the plants.

That these changes of structure determine the duration of plants, in a manner similar to those of the different species of animals, is a fact which derives confirmation from the opinions of a celebrated writer on vegetable physiology. He ascribes the diseases and debility of old age in trees, to their inability to produce leaves, which perform the same office as lungs in animals, and to a consequent imperfection of their circulating fluids. He also says, that the leaves annually reproduced in young plants, differ essentially from the leaves of an old variety; and that the natural decay of old age in trees and animals, appear to arise from similar causes.—Mr. Knight's paper, in the Phil. Trans. part II. 1810.

The different length of life in the small tribes of annual plants, which, like winged insects, live from three to twelve months; and in perennials, which, like large animals, live the greatest part of a century, will admit of the following explanations.

In *Annuals*, the alimentary juices, and the energies

closes, after a great length of life, to which, very fortunately, few of the human species arrive.

The system returns to the imbecility of the first epoch of infancy. The body staggers in walking;

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of the plant are wholly employed during infancy, in the growth of their system; but on their arrival at maturity, they are directed towards the parts of fructification. And, when the reproduction of species is completed, the most irritable parts of the plant, the petiole, or leaf stalk, becomes liable to induration, and to a contracted circulation from increasing cold, which renders their leaves deciduous, and occasions the naked plant to die within the revolution of a year.

Perennials increase their alburnum, and elongate their branches, until new germs are formed; but, after their exhaustion by generation, the circulation decreases, and the feeble stalk of the leaves yields to the equinoctial gales. As the plant, however, retains sap sufficient to form new radicles, life is sustained until the returning circulation renews the respiratory foliage, in the spring of the year. And this prolongation of life in biennials and perennials, depends, therefore, upon the annual reproduction of radicles, which renew the leaves, and the vigour of the plant for a succession of years. But, at the same time, there is a general increase of rigidity, taking place in the root, stem, and branches. Hence, the sap and air vessels, which were large and vigorous in the infancy of the plant, become at length so hard and contracted as to obstruct the circulating fluids, in consequence of which, the plant dies in every part, from defective nutrition. We often perceive in old trees, their hardest part, the central wood, decayed, while their cortical part remains entire.

tears are shed from trivial affections of mind; drivelling takes place from the nose and mouth; the demands for food are frequent; the tendency to sleep is great; intoxication occurs from small portions of strong liquors; the mind is timid, and occupied with trifling objects; and a garrulous detail of past circumstances, too often characterize the period of second childhood.

The physiological changes of this last age, produce emaciation, and rigidity of the whole body, which terminate in a state of universal palsy, and loss of circulation.

It is a law of the animal economy, that whenever nutrition fails, the absorbent vessels begin to remove certain parts of the solids, to keep the body alive as long as possible, and this is the principal cause of the *Emaciation* which we observe in the latter stages of life, after the system has lost most of its powers of renovation. The fat and cellular membrane on the surface of the body, the marrow of the bones, and even the bones themselves are absorbed into the circulation in this period.

Hence we find, that the eye, which rolled in a bed of fat, sinks in the socket, the straight muscles of the globe contract, and the bony orbit becomes sharp and prominent. Not only is the forehead covered with transverse wrinkles and deep fur-

rows, but the angles of the mouth are drawn downwards, the chops become pendulous, and the muscles of the neck lank, like chords: in short, an emaciated body, and projecting veins, appear through a loose skin, in most instances of great old age.

The osseous fabric, in a state of permutation from the beginning to the end of life, derives its principal character from the phosphate of lime, which gives the bones different degrees of solidity at different ages. Before birth they were reddish cartilages; in youth they consist of one-half osseous matter; in manhood the calcareous matter is so abundant as to contract the foramina through which the vessels pass: in senescence they are brittle, and their vessels so much contracted, that they do not exhibit the tinge of madder as in young animals; and in the age of decrepitude they become spongy, and lose much of their specific gravity. It is well known to anatomists, that the bones of aged subjects are unfit for anatomical preparations, they become filled with oil in their porous state, and cannot be dried, by reason of their greasy nature.

Not only the phosphate of lime, but even the cartilaginous substance of the bones, is absorbed. The scull grows gradually more furrowed through life; its two tables are at length so

blended together, that the diploe disappears, and the scull becomes much thinner in advanced years than before. It is at least a third lighter than it was in middle age. The lower jaw loses a third of its depth, and more than half of its weight. If there are any residuary teeth, they of course drop out, and leave the lateral parts of the inferior maxillary bone to masticate the food, and the indurated gums to perform the offices of teeth. The spine loses nearly half the weight it possessed in the meridian of life, and the long bones acquire larger cavities.

This state of the bones gave rise to a superstitious trial of old persons for witchcraft, by an attempt to drown them. In middle age the specific gravity of the human body is somewhat less than an equal bulk of fresh water. Many good swimmers can, therefore, lie on their back, quietly in the water, with all the parts of their body immersed, except the mouth and nose; whereas, other persons, through fear, attempt to bring the whole head above the water, thus exceeding the difference of the specific gravity, and destroying the equilibrium between their bodies and the water. This is the frequent cause of drowning. But in the latter stages of old age, the body having lost a third of its weight, from sponginess of bones, and dryness of fabric, it becomes of course more buoyant.

The osseous matter, thus taken into the circulation from the bones, is, in great part, employed in increasing the *Rigidity* peculiar to the period. Mr. Hatchet has shewn, by accurate chymical analysis, that calcareous phosphate is not only a constituent principle of bone, but that it also abounds in all animal substances, in different proportion, according to the age. He found it most abundant in the flesh of old animals, and, therefore, obtained more of it from beef than from veal.

As rigidity prevails most in parts of the body which have had greatest action, the heart and its great artery become tendinous, and often bony; but in many old persons, in whom no ossifications take place, the coats of the large arteries are often found worn down to a thin weak state, from the constant stimulus of the powerful vis a tergo producing absorption. Indeed ossifications appear to be the last *efforts* of a living principle, to counteract the supervening debility of the coats of the vessels, in old age. These concretions are so common, that they are found in two-thirds of all men, who die above seventy-five years of age. The phosphate of lime is deposited in different points, in the cellular membrane, connecting the coats of the arteries. These ossific points unite more and more by age, until they at length destroy the muscular coat of the artery, or form an osseous

case, which contracts its cavity, and thereby impedes the circulation of the blood. But men can exist many years with ossified vessels. Dr. Mounsey, who died at the age of ninety-six, in a more ossified state than any other person, lately dissected in London, as will appear from the following chapter of this treatise, predicted for 25 years the existence of ossifications in the arteries of his own body; and what is very remarkable, his pulse acquired greater regularity after he was seventy-five years of age, than it possessed for many years before.

Universal palsy takes place in this epoch, from failure of both the nervous and muscular systems. We are sensible of changes in the structure of the brain, from the rapid decay of mental faculties, as well as from its general appearances on dissection. It has certainly contracted its substance; it does not so completely fill the cavity of the cranium as in early life, and its subdivisions are more distinctly marked, by increase of years. Its arteries and membranes are much tougher and firmer, than in younger days, and they become incrusted with osseous laminæ in many old people. At birth, the substance of the brain is so fluid as scarcely to sustain its own weight, and it acquires greater firmness in middle age, but to

what degree the density increases afterwards, has not been properly ascertained.

A distinguished anatomist says, decidedly, "that the brain in old men is diminished in size, and more compact in its structure than in less advanced years, although its volume does not diminish in proportion to its increase of density, and that this induration is probably the cause of the loss of memory, the blunted sensibility of the organs of sense, the diminished irritability of the heart, and the enervated action of the muscles in old people*." But several eminent teachers of anatomy in London, have not found the brain more generally rigid in old age than in the meridian of life. One in particular informed the author, that he never demonstrated upon the brain of old subjects, on account of its more flaccid and infirm state. The truth seems to be, that the brain is so frequently diseased in old age, and therefore so often soft and loaded with serum, that it is extremely difficult to discover the natural state of its structure in this late period.

It frequently happens, that the voice becomes shrill and tremulous, and shaking takes place in

* Portal d'Anatomie, tom. iv. p. 93. who quotes Meckel, tom. xvi. de l'Acad. de Turin, An. 1760.

the extremities of the body, from contraction of the pulmonary passages, and from general weakness of the muscles. Sometimes paralysis of the sphincter of the bladder and anus, occasion involuntary evacuations; and at other times, all the powers of the body fail together, and the mortal scene closes with insensibility, lethargy, and stoppage of circulation.

When the body is thus worn out by natural decay, *Dissolution* takes place, often without a struggle. The irritability of the muscular fibre, and the sensibility of the nervous system, are so much diminished, that the vital principle can no longer carry on the circulation of the blood, which consequently becomes languid in the lower extremities. At length, the efforts of the muscles and arteries are unable to propel it through the lungs. The left side of the heart no longer receiving the stimulus of blood, a complete expiration, from contractility of the thorax, terminates all the functions of life. The right auricle dying last, the mass of blood is found accumulated in the veins, and right side of the heart, after death. But these phenomena are only indications of death from old age, in other cases, the stoppage of respiration is no criterion of the extinction of life, for irritability remains in the intestines and muscles, particularly in the heart, after the sensibility

of the nerves is destroyed, hence the Humane Society have restored persons after three quarters of an hour's submersion in water; and in cases of sudden death, the only unequivocal signs of the total extinction of the vital spark, are deduced from the commencement of general putrefaction, and from the accompanying phenomena of dilated pupils, fixed eyes, and a cold rigid body *.

Finally, the lifeless corpse, after a few days, is transmitted to the peaceful bosom of the parent of nature, that its substance may be decomposed into its original elements, and that the disengaged effluvia, absorbed by the soil, may assist in the regeneration of new organic beings.

* This remark cannot be too much attended to, as it is a certain fact, that many persons have been interred alive at different times. The celebrated anatomist Vesalius, born at Brussels in 1512, when the opening of morbid bodies first came into practice, on cutting into the breast of a Spanish nobleman, who he supposed to be dead, saw the heart beating, and was therefore condemned to perform a pilgrimage to the Holy Land for murder and impiety, and he perished by shipwreck on returning home.

CHAP. VI.

THE GENERAL APPEARANCES ON DISSECTION, OF BODIES THAT HAVE DIED OF OLD AGE.

ALTHOUGH natural death approaches in the gradual manner already described, from a general failure of the system, it more commonly happens, that some parts of the body are attacked more violently than others, in the period of decline, as well as in all the other stages of life. We, therefore, find, on inspecting aged bodies, a variety of appearances; we shall, however, adduce from authentic sources, some instances of the most common state of the organization in bodies that have died in the age of decrepitude.

1. The appearances of a very old man, a shoemaker, dissected by Morgagni, who died partly

of old age, and partly of a catarrh without fever, were as follows*:

In the head, there was an uncommon close adhesion of the dura mater to the cranium; and the medullary substance of the cerebrum and cerebellum, were brown. The three ventricles were full of water. The pineal gland was enlarged with a serous humour, and the pituitary gland was contracted and shrunk. The arteries running on the basis of the brain, were wider in their trunks and branches than usual. The heart and the trunk of the aorta were enlarged; and the valves of the aorta were bony. A whiteness appeared upon the internal surface of the whole trunk of the aorta, approaching to ossification; and there was a perfect ossification at the division of one iliac artery. The thick ligaments between the vertebræ of the spine, were prominent on their anterior surface, and projected the breadth of a finger at the sides, while the whole of those on the left side, and two on the right side, were bony. The stomach was not only narrow, but of a bad figure; and a little white excresence projected from the prostate gland into the urethra.

Morgagni describes some other appearances of

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* Morgagni de caus: et sed: morb. Ep. xxxvii. A. 30.

this case, which were accidental, not arising from age, and therefore do not require notice in this place; we may, however, mention, that there was also a very small spleen near the fundus of the stomach, like a gland, receiving vessels from the omentum, together with the true spleen in its proper place, but rather smaller than is natural.

2. The appearances of John Bayles, a button-maker, who died about his hundred and thirtieth year, as they were accurately traced by Dr. Keil, shew the general effects of age upon human structure, better than any dissection we have met with *.

He lost his eyesight some years before he died, but retained the perfect sense of hearing. His digestion was very bad, and he seldom had more than one alvine evacuation in ten or twelve days. All the internal parts of the body had their regular sound appearance as in a healthy adult, with the following exceptions arising from age.

The frame was so emaciated, that the shape of the muscles was distinctly seen through the skin, and the omentum was uncommonly small. The flesh and the skin felt hard, and the brain firm, hard, and dry on cutting. Some parts of the

* Phil. Trans. abr. vol. 5.

dura mater were ossified, and the ventricles of the brain were loaded with water. The lungs had a white colour, interspersed with small spots of blood. The chest was capacious, the ribs brittle, and the heart large, thick, and fat. The aorta was enlarged to about two inches in diameter, and was in a rigid cartilaginous state: as were also the iliac arteries. He, therefore, had an irregular intermitting pulse for a great many years before his death. The stomach was no thicker in its coats towards the spleen than writing paper; and its internal rugæ were worn away. The bowels had a pale or white appearance, from contraction of their blood vessels. It appeared remarkable, that the spleen of this man was no larger than the size of a kidney, similar to the contraction of that lax viscus in Thomas Parre.

Dr. Keil ascribed the extraordinary longevity of Bayles to the strength of the vital organs, which greatly resembled those of Thomas Parre, who died of plethora of the lungs, at the age of 152, as related in the Philosophical Transactions. He also supposed the state of the stomach, spleen, and aorta, to have occasioned his death, as he was badly nourished, and the circulation was obstructed by the loss of elasticity and contractility in the great artery; in consequence of which,

the greatest part of the blood was found, after death, in the arteries instead of the veins.

3. Thomas Gibson died at Dartford workhouse, in Kent *, on the 26th of February 1810, at the advanced age of 106 years, as certified from Dover, the place of his nativity. He maintained himself by labouring incessantly at hop-planting, until the age of a hundred; but was afterwards six years in the workhouse, and the master declared he was regularly intoxicated almost every day, during his residence there, in consequence of money which was given him by strangers passing through the town. Six weeks before his death, he met with an accident, which, occasioning slight ulcerations of his legs, and confined him to bed, but of these he did not complain, and boasted of never having taken any medicine in his life, as his health had always been good. His face was strongly impressed with the lineaments of great age. He walked nearly double sometime before his death, and his dissolution seemed to arise entirely from natural decay.

* The author considers himself greatly indebted to his friend, Mr. Astley Cooper, for the trouble he took, in obtaining an account of the following dissection, from Mr. Thomas Oak of Greenwich.

Mr. Oak says, on opening the body, in presence of Dr. Sutton, and Mr. Peate of Dartford, the lungs were found adhering partially to the pleura of the ribs, and there was a small quantity of water in the chest. The heart was not larger than usual, but all the great vessels, particularly the aorta, were enlarged to nearly three times their natural size; and the coronary arteries were ossified. The coats of the large arteries were so extremely thin, that there was great difficulty in removing them from their situation. They were so completely changed in structure, as to give way on the application of the smallest force. These were the most striking circumstances found on the examination of this man; for the viscera of the abdomen, kidneys, bladder, and prostate gland were little changed from their adult appearance. There was no time to examine the brain, as the people of the house had permitted the faculty to inspect the body, merely on the supposition that they intended to prepare it for the coffin, by setting the legs at liberty, which were in an uncommon state of contraction.

4. The following is a short account of a dissection, which, as far as the author can learn, has never before been published. The subject is a well known physician, Dr. Mounsey, who died

in London, twenty-three years ago, and left his body by will to be dissected. The author's friend, Mr. Forster, surgeon of Guy's Hospital, has very obligingly favoured him with the following particulars of the case, and of the appearances on dissection.

Dr. Mounsey could neither be considered as possessing a very sickly, nor a perfectly healthy constitution. He had always been temperate, but was too fond of study to be active. He generally forgot his complaints after dinner, when his spirits, wit, and learning, made him a most desirable companion. At the age of seventy-five, he complained much of an immediate sense of giddiness on lying down, and the same on rising from the horizontal posture. His pulse had considerable intermissions, and more when he was up, than when he was in bed. The intermission in the day was equal to about three beats every fourteenth stroke, resembling a stoppage of the circulation; but he was not conscious of any inconvenience from its irregularity, and said, he was certain his heart was ossified, and that the giddiness of his head proceeded from the enlargement of the upper part of the aorta.

When turned of fourscore, he complained of cold feet, and a difficulty of moving them after he had continued long in one position, but when

once put in motion, he went on tolerably well. On rubbing them with the hand, a smarting and pricking of the toes distressed him for a few minutes. These symptoms he ascribed to the progress of ossification from his toes upwards, and the appearances on dissection, shewed how justly he traced the symptoms to their causes. The day before his death, he was particularly cheerful; he retired to bed at eight o'clock, his usual hour, and awaked about two in the morning, complaining of great weight in his lower extremities, in which there was no sensation until the servant had rubbed half up his thighs. He then said he was dead so far, called for a glass of Madeira, with some bread, to support him until his friend, Mr. Forster, should arrive. He, however, soon became faint, and on lying down expired, without any expression of pain, in the 96th year of his age.

On opening the body, the heart, aorta, and pulmonary artery, were found considerably enlarged, with the appearances of many ossific deposits distributed over them. On removing the heart from the body, its external surface was covered with many patches of fat, the septum, between the auricles, as well as the tricusped, mitral, and semilunar valves, were found so greatly ossified, as to excite wonder how the circulation could be carried on. The iliac arteries were also much ossi-

fied, and the femoral, as well as all the other large arteries, extending to the very toes, were nearly continued tubes of bone. The vertebræ of the spine were spongy, and their intermediate cartilages nearly absorbed. Some of them had grown together, and others were covered with Exostoses of bone. The whole spinal column was much shortened, and did not appear to possess half the weight it did in middle age.

It occurred to the author, on viewing the preparations of this uncommonly ossified subject, at Guy's and St. Thomas' hospitals, that the appearances afforded a satisfactory explanation of the foregoing history of his case. The dilatation of the cavities of the heart and great artery, must have arisen from their increased efforts to overcome the osseous resistance: the intermission of of the pulse, from the ossifications of the valves and vessels: the greater regularity of the pulse in the horizontal posture, from a freer circulation of blood at that time: the giddiness of the head upon changing his position, from the different distributions of blood to the brain: the coldness of the extremities, from their languid circulation: and the exostoses of the bones, and ossified vessels, from the calcareous matter absorbed from the other parts of the bony fabric. On considering all these phenomena, and the length of time the

ossifications took in forming; we discover a beautiful series of cause and effect, and a convincing proof, that however long the existence of the body may be protracted, it must ultimately yield to induration.

ESSAY II.

THE DISEASES

TO WHICH THE BODY IS PREDISPOSED

IN EACH PERIOD OF LIFE.



BY predisposition, we understand an inherent state of living organs, which prepares them to assume a state of morbid action, when certain occasional causes affect them; or, in other words, an aptitude of the body to receive particular diseases at one time, more readily than at another. This condition of the body most frequently arises from a change in the state of the equilibrium between its living powers and external agents by age, and from the many accidents to which it is unavoidably exposed. But we do not, with Dr. Brown, consider predisposition as a middle state between

health and disease, or a slighter kind of disease, differing in degree only, from that which attacks the predisposed person, since it prevails in different species of inferior animals, as well as in human beings, in their healthy condition; and many men pass through a long life, without any important disease, notwithstanding there existed a particular disposition in the habit towards it. It in fact happens, that persons escape these diseases as often as they suffer from their attack, at the very time they are predisposed to them. Nay, we often find organs possessing a morbid tendency, even before they commence action, since the lungs in their collapsed state, the organ of hearing, and other parts of incomplete growth in the womb, are often in a state of predisposition to disease, before they assume their functions.

Diseases, therefore, are not always a necessary consequence of predisposition, and they happen only when called into action by exciting causes. Their powers then prevail with different degrees of force, according to the relative debility or firmness of habit. Hence it is, that different diseases so often arise out of the same kind of predisposition, for it frequently happens, that in scrofulous temperaments, neither the glands nor bones are affected; but young people, from the

debility attending those temperaments, become a prey to diseases of a different kind.

The human body, composed of many delicate organs with complicated movements, is liable to have the harmony, and correspondence of its functions interrupted, or totally destroyed, by numerous fortuitous circumstances, and by various kinds of stimulants, which operate upon an organization common to all men, in every stage of life. But there also exist, peculiar conditions of the fabrication, and of the structure of the different organs, both connate and acquired, which are variable, and render some periods of life, as well as particular individuals, more liable to diseases than others, upon the application of the slightest occasional causes. Hence arise, what are generally called constitutional diseases.

Certain *hereditary tendencies* of constitution, and peculiarities of temperament, derived from parents, render many persons susceptible of different specific diseases; and, although the existence of hereditary diseases has frequently been called in question, yet it is now generally understood, that children, who derive resemblance of face, voice, and mental character, from their parents, likewise inherit many of their diseases. Some morbid appearances commence almost as soon as the existence of the individual; others are

more slowly formed from a state derived from original stamina; and, whenever we discover a great number of persons of particular families, affected with diseases of the same kind, we cannot help ascribing them to a common predisposition. But there is scarcely an instance of diseases themselves being communicated from the parent to the offspring. Perhaps the lues venerea may be one. It is commonly the particular state of stamina or temperament producing them, that is inherited: and this is the reason that their precursory signs are frequently eradicated, and the disease prevented.

The disposition to diseases of progenitors, bebomes perfectly apparent in those periods of life, which, from change of structure, favour the operation of occasional causes. Thus, rickets generally attack the fluid organization of infancy, and scrofula its firmer state. Pthisis pulmonalis does not take place before the period of pulmonary evolution, nor mania or gout before the strong state of manhood. The same may be said of hydrocephalus, stone, epilepsy, cancer, leprosy, and all other hereditary and constitutional diseases, which attach themselves to particular ages; whereas, if predisposition constituted incipient disease, the period of infancy being the weakest, and most susceptible part of life, would never

escape all kinds of hereditary diseases, which is certainly not the case.

Different *temperaments,* which are founded on the varieties of density, sensibility, sympathetic action, strength, and activity of constitutional structure, in individual men, constitute a primary order of predisposing causes, as was particularly noticed in treating on the varieties of mankind in adult years. Numerous other conditions of stamina, acquired in the course of life, by climates, habits, and particular kinds of food, likewise dispose the body to peculiar diseases; but the developments of age and sex, are the most common of all predisposing causes.

By the *evolutions of age* many diseases disappear spontaneously, as the irritability of the solids diminishes or density increases, while others are superinduced by increased elasticity of fibre, or derive existence from new sensibilities, originating in body and mind, in consequence of the various evolutions of the periods. In short, all the remarkable changes of the body, are attended with an alteration of the structure of the organs, which renders particular ages susceptible of the action of certain stimulants, and liable to the attack of particular diseases. Thus, we frequently observe the same exciting causes, which produce

peculiar diseases in infancy, occasion others of an opposite character in old age.

It is owing to the changes of age, that the generality of diseases are common to the species all over the world, and that most of them have appeared, without any essential difference of character, since the time they were accurately recorded by Hippocrates, to the present day. That diseases were the same in his days, and in his country, as they now appear in these islands, the following translation of his aphorisms, will satisfactorily shew.

"Children newly born, are subject to apthæ, thrushes, pukings, coughs, watchings, startings in the sleep, inflammations of the navel, and humours of the ears; at the period of teething, to irritation and ulcers of the gums, fevers, convulsions and diarrheas, especially when they are lusty, and bound in the body; at an older age, to congestions of the tonsils, distorted spine, difficult respiration, stones in the bladder, round worms, ascarides, stranguries, warts, swellings of the parotid gland, and strumous tumors.

"At puberty, they are subject to diseases of the former period, and to tedious fevers, and bleedings of the nose. But many diseases quit them this age, and when they continue longer, espe-

cially after the establishment of the female periods, they become obstinate and protracted.

"Youth is subject to spittings of blood, consumptions, acute fevers, and epilepsies.

"The diseases following this age, are, difficult respiration, pleurisies, ardent fevers, fluxes of the belly, effusions of bile upwards and downwards, dysenteries, lienteries, and piles.

" In old age, men are subject to asthmas, defluxions, coughs, stranguries, pains of the joints, diseases of the kidneys, vertigo, apoplexies, cachexy, itchings of the body, watchings, humours of the intestines, eyes, and nose, dimness of sight, glaucomas, and deafness *."

If we consider these diseases in a general point of view, the greatest number of them may be traced to the excessive fluidity, and acute sensibility of the organization in early life, and to its rigidity and insensibility, in the latter stages of existence. But to arrive at the most accurate knowledge of predispositions, from the successive states of organization, we shall severally distinguish the diseases of each period. It is also necessary to premise, that in many instances of our narrative, a brief account of the formation of the

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* Hippocrates, Sect. iv. Aphor. 24. ad 31.

disease, is subjoined to the time of its appearance, that we may better establish its diagnosis, and render the essay something more than a mere enumeration of names.

CHAP. I.

THE DISEASES TO WHICH THE BODY IS PREDISPOSED IN THE FŒTAL STATE.

WE are completely ignorant of the scheme of divine Providence in the waste of incipient life, but we can discover some of the means, by which the perishable materials of the machine are destroyed, in its early state, by attending to the numerous abortive and congenital diseases that appertain to human pregnancy.

In the FIRST EPOCH of uterine gestation, *abortions** occur more numerously than at any

* Abortions are more frequent among human beings than other animals, on account of the erect posture, menstrual flux, and nervous sensibility, peculiar to the species. We

after period, and are always fatal to the embryo. The greatest number take place about the eleventh or twelfth week of pregnancy, before the embryo

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know not to what degree wild animals are subject to them; but we are certain that domestication has great influence in producing them, on many occasions. They are very common among black cattle, between the fifth and seventh month, and so little are their causes known in these animals, that they can seldom be prevented.

Sheep are very liable to them, by reason of their tender constitution, and the injury they sustain from cold and damp situations. They are not uncommon among hogs, cats, dogs, and hares. Eggs of birds, especially those of domestic poultry, are liable to numerous failures, from the death of the embryo in the shell.

In the *Vegetable kingdom,* abortions are still more frequent than they are in the animal, as well from the diseases of the parent stock, as from those of the sprouting germ. Some plants bring forth flowers without fruit, while others, from the influence of frosts and winds over their feeble structure, drop their fruit immaturely. The destruction of their sweet and succulent fruits by rapacious birds, of their kernels by the larva of insects, and of their germinating seeds by the vermin of the earth, would hardly allow of a sufficiency for the continuance of the species, if the premature destruction was not provided for by a profusion of ova, and by the immense reproductive powers of the kingdom. A single head of garden poppy yields above 3000 seeds, the tobacco plant, above 40,000, and other instances prove, that the law of seminal profusion extends to all orders of animated nature, as well as plants, as if it was required to preserve an equilibrium in the number of organic beings.

has become firmly attached to the uterus. They also occur, although less frequently, after the fœtus has acquired greater strength and adherence, about the fifth month. In these cases we, for the most part, can trace the immediate causes of the fatality to the mother's system, the connecting media, or the fœtal structure.

The dependance of the offspring upon the parent for nutriment, as constituting part of her body, exposes it to great danger, from her fevers, convulsions, dropsies, and the irregularities of her life, but more especially from the diseases of her uterine system. Thus, the rupture of the membranes, through the mother's accidents, seldom fail to occasion abortion, by bringing the naked fœtus into immediate contact with the parietes of the womb. But uterine hemorrhages are by far the most frequent causes of the evil, since the most trifling loss of blood, separates the child from the source of its nutriment. This is the principal reason, why delicacy of constitution, and irregularities of life, render the higher ranks of females more subject to abortions than the lower orders, notwithstanding it might naturally be expected, that habits of drunkenness, and exposure to numerous accidents, would render the latter most liable to these misfortunes.

Imperfections of the connecting media, very

generally destroy the circulation between the body of the child, and the maternal part of the placenta. So precarious is the situation of the child, in the womb, that slight alterations of the structure of the placenta, twists of the chord round its body, or more especially a compressed, impervious, putrid, or dropsical state of the chord, seldom fail to kill it. The membranes loaded with blood, or with tumors, and hydatids, are common causes of abortion; but, above all, effusions of blood between the exterior membrane of the ovum and the membranous production of the uterus, are, by an author of great experience, said to detach the ovum from the womb, oftener than any other cause whatever*.

Imperfections of growth in the fœtal structure, are also common causes of abortion. But the existence of the mother, and that of the child, are so independent of each other, that the fœtal spark of life is, for the most part, extinguished, some weeks before the abortion takes place. This individuality becomes still more conspicuous in the well known facts, of consumptive mothers bringing forth healthy children, and robust females bearing diseased ones. And for the same reason,

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* Dr. Denman's Introduction to Midwifery, vol. ii, p. 322.

also, fibrous coagula of blood, moles, and monstrous productions in the uterus, seldom prove injurious to the mother's health. But we shall be better able to trace the disorganizations of the fœtus, by attending to the advanced state of its structure.

In the SECOND EPOCH of uterine life, the fluidity of structure, irregularities of growth, and hereditary debilities, to which the fœtus is subjected in the womb, predispose it to various morbid actions, which we mostly discover at birth.

Although the knowledge of *Congenital Diseases* may add little to the improvement of practice, either with respect to cure or prevention, it will at least serve to shew, the wonderful resources of nature, and the manner in which she carries on the functions of life, when she deviates from her usual arrangement of parts. But the morbid propensities of uterine life, constitute an indispensable link in the history of the body, as they often lay the foundations of its future state, and determine the mortality of a great portion of the species.

External Marks of the cuticular surface, in consequence of an uncommon activity of capillary vessels, and the many accidental pressures the skin of the fœtus is exposed to, in its confined

situation, are the most common of all congenital appearances. The florid granulations, and their changeable redness, appearing through a transparent cuticle, have given rise to many fanciful opinions concerning the influence of the mother's imagination, and the effects of the seasons of the year, over the slender structure of her child. But it is well known, that the mind of the mother, has no such power over the surface of her own body, and that there is no direct communication of vessels between the two systems. Neither the mother nor her child express signs of pain, when the connecting chord is cut in pieces, and the few nervous filaments of the funis, have no kind of communication with the uterus.

Adhesions are also common appearances of the new born child, from the highly vascular, and growing state of the skin. Toes and fingers connected together are of little consequence, as they can readily be separated by incision; and *Distortions* of the feet equally common, from a cramped position of the child in utero, can as easily be removed, by mechanical pressure after birth. But deep seated *Imperforations* of the anus and urethra, are of a much more alarming nature, as they approach towards monstrosity, and obstruct some of the most important functions of life, after the child is born.

Monstrous Appearances, constitute by far the most fatal diseases of the fœtus at birth, and arise from irregular growth of fœtal parts in the womb. Monstrosities are even more frequent in the human species than in quadrupeds. Since calculations have been made for the General Westminster Dispensary of London, that there occurred one monstrous birth in every two hundred and forty-one labours; and more than a third of these preternatural appearances were born dead*. They must therefore be considered as diseased productions, which occur casually, and although they may continue through a long life, they cannot entail the same irregularity of structure upon succeeding generations.

Those with *superfluous* organs, may probably proceed from concretion of twin parts, like two yolks in bird's eggs, more especially as they are generally found in mothers who bring forth two or more fœtuses at a time. One part of a twin may be absorbed, while the other part connects itself to the adjoining twin, in the early state of the ovum. We have evidence of some instances of this kind, recorded in the Philosophical Transactions, where children are described as being

* Phil. Trans. Ab. vol. xv. p. 119.

connected by the intermixture of the organs of the belly or back only. At the same time it must be acknowledged, that many double parts of minor importance, such as supernumerary toes and fingers, may arise from exuberances of growth in single individuals.

Most of the instances of *Monstrous twins* on record, have been of the same sex, and as they have either been born dead, or lived only a short time after birth, the relation of a case of twin sisters, from an early volume of the Philosophical Transactions, who lived to be twenty-two years of age, may not be altogether an uninteresting illustration of our subject. They were brought from Hungary, and shewn in London, in the year 1708, when they were six years old. They were conjoined at the small of the back, with their faces turned a little sideways, so that they could sit down. Internally, the bones of the sacrum, and the rectum intestine were united. They had distinct feelings in every part, except where they were joined, but the external parts of generation and the anus, which had their natural appearances, were single, and common to both. When one twin stooped, she carried the other from the ground. One often slept, waked, ate, and drank, at different times from the other. They were lively, well-bred

girls, who spoke and wrote three different languages. They loved one another affectionately, and often kissed each other, but quarrelled in their early youth, in consequence of the desire for urinary and alvine evacuations, occurring to them separately. They had beautiful faces, were well shaped, genteelly dressed, and employed themselves in the lace manufactory at Presburg. They died within a few minutes of each other, the one from convulsions, and the other from fever, in the twenty-second year of their age *.

The *Double Head*, which sometimes occurs in the human species, and very frequently in quadrupeds, can be considered in no other light, than as parts of twins, and the most remarkable one on record, was brought from the East Indies, and deposited in Mr. Hunter's museum, now belonging to the College of Surgeons. One skull is inverted over the other in a continued surface of bone. The child lived two years with two distinct heads, connected at their crowns, in the exercise of all the functions of the natural head, and most of those of the inverted one. The superior head sympathized with the inferior one in many things; but as the recorder

* Phil. Trans. Ab. vol. xi. p. 144.

observes, the child being unfortunately killed by the bite of a snake, prevented the discovery of the effects of a double brain upon the intellectual faculties*.

Monsters with *defective parts*, are also frequent errors of growth, which must depend upon some unknown process of imperfect nutrition, or absorption of parts, soon after their formation. The *Want of a Head* is the most remarkable instance of this kind of monstrosity. Acephali, however, seldom want the whole head, since the basis of the cranium, and the foramina through which the vessels pass, are generally existing. Therefore, the want of the upper part of the head, is not an uncommon appearance, and it may arise from the separation of the cranium, the last ossified part of the head, in the membranous state, from putrefaction, or dropsy, or it may be torn from the base of the cranium, in the time of labour.

But there are also some rare instances of the human being born without any part of a head or brain. Thus, two cases of children born dead at the full time, without brain or even the medulla oblongata, are recorded in the Philosophi-

* Phil. Trans. Ab. vol. xvi. p. 663.

cal Transactions *, as well as several other extraordinary productions of the human species, which shew in the most striking manner, that the fertile powers of nature are unlimited. But they demonstrate besides, that the simple life of animals can exist independent of a nervous origin: and that systems nourished by blood vessels, can grow without the usual organs, which perform the animal functions. They do not however prove, that any thing like a human being can be formed without nerves †. These appearances, on the contrary, favour the opinion, that the medullary part of nerves is not formed from the brain, but co-exists with the first formation of all sensible parts, and connects them, as we before noticed in our introductory observations, on

* Phil. Trans. Ab. vol. xiii. p. 654. vol. viii. p. 386.

† The most extraordinary disorganization of a human being we know of, is described in the Philosophical Transactions, as being incomplete in all its parts. An oval substance four inches long, and three wide, inclosed in distinct membranes, containing liquor amnios. A placenta and funis communicated with the placenta of a healthy child previously delivered. This substance had no external appearances of a human being except two feet, with two or three toes. And there was no brain, nerves, vertebræ, stomach, head, nor lungs, but only a small intestine.—Phil. Trans. Ab. vol. xvii. p. 313.

simple animals without brain. There must either be nerves or nervous matter co-existent with the original stamina of all animal bodies, and brain besides, in the more perfect species; for although neither external impression, nor volition, are wanted for fœtal existence, some origin of nerves is required for future life.

Hermaphrodites are casual appearances of two sexes in the same individual, which are sometimes found in the human species; but neither men nor quadrupeds possess prolific organs of both sexes, like androgenous animals among the invertebral tribes, which propagate either as male or female in the same individual, by the established laws of nature.

Those unnatural appearances of structure, in the male of the human species, are generally formed by fissures of the scrotum, leading to the canal of the urethra; and in the female, by an enlargement of the clitoris, or protrusion of the uterus. But there are also at times, intermixtures of the parts of both sexes occuring in the same individual, which more nearly convey the idea of nature's attempting to form a real hermaphrodite. Mr. Hunter has shewn, that Neat Cattle sometimes bring forth a perfect male, in the same birth with a Free Martin, which possesses organs of both sexes, but without possess-

ing the prolific powers of either. An instance is also recorded in the Philosophical Transactions, as seldom occurring, of an old dog, which possessed a mixture of male and female parts*.

Many admixtures of particular parts of the organs destined for the continuance of the species, occur in human individuals of both sexes, most of which are displacements of generative organs, such as the substitution of testes for ovaria, and vice versa. An ingenious idea has therefore been suggested by Mr. Home, to explain these intermixtures, which is, that probably no distinction of sex exists in the rudiments of the embryo, before the time of impregnation, and that the stimulus of the male, failing at times, to stamp a perfect impression of either sex, the character of male or female will predominate, according to the formation of testes or ovaria, since these exert a considerable influence over the other generative organs.

A small Head has been supposed to arise from a too rapid formation of the cranium before birth, and to be a means of rendering children liable to convulsions and apoplexy afterwards: but the healthy and gradual adaptation of these parts to

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* Phil. Trans. abr. Vol. xviii. p. 485, 491.

each other, during their formation, instead of causing oppressed brain, may more properly be considered as a sign of personal strength. Mr. Jackson, the celebrated teacher of pugilism, laid it down as an axiom, that men with small heads are the strongest, and fittest for training*. Hercules, and the athletic heroes of antiquity, are represented with small heads, in comparison of the size of their bodies; but it may be supposed that in such cases, the head is formed in the usual proportion, and that the other parts are afterwards developed in greater magnitude, by means of continued vigorous exertions of the muscles.

Hare Lip is an imperfect junction of the sides of the upper lip, which coalesce later than the other teguments of the head; but the defective growth is not confined to the soft parts, since there often exists, at the same time, a deficiency of ossific matter in the superior maxillary and palate bones, so that the nose and mouth are formed into one cavity.

Ruptures of the Navel found at birth, are produced by protrusion of the intestines through the opening of the belly, where the chord passes, and although the sac is usually filled with intestine,

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* Sir John Sinclair's Code of Health, Vol. II.

it is at times dilated with a portion of the liver, which proves a less dangerous disease, since it generally disappears soon after respiration commences, by the formation of the suspensary ligament of that large gland. In a manner similar to these appearances, *Hernia congenita* takes place at the abdominal rings, those parts being the most incomplete, at the time of birth. But water is at times found in the vaginal coat, as well as intestine, forming a species of *Hydrocele*, which is soon absorbed after birth.

A *large Head* is the most common, as well as the most dangerous, of all these kinds of congenital appearances, even when the fœtus looks healthy in other respects, because it evinces a strong tendency to a dangerous disease, either from want of ossific matter to restrain the preternatural growth of brain, or what is worse, arises from serous effusion, already formed in the cavities of the cerebral organ. In this way the size of the head, which in its natural state at birth, scarcely exceeds a third part of the bulk of the body, is sometimes found at the end of pregnancy, half the magnitude of the whole fœtus; and many children are born dead, with a membranous cranium like an inflated bladder, distended by serum to so great a degree, tha‘ neither brain nor face can be seen.

A circumscribed *Tumor of the Brain*, called a

Rupture, pushes at times through the deficiency of the fontanelle, as large as a hen's egg. But it readily disappears spontaneously, as the head acquires greater consolidation, if it be not mistaken for a contusion of the scalp, and thereby treated improperly.

Effusions of Water are common consequences of all kinds of aberrations of the cerebral substance, and prove the most dangerous diseases of fœtal life. We observe, that besides dropsy of the brain, the *Spina Bifida* is likewise attended with watery effusions. Thus, the livid protrusion of membranes at the posterior part of the vertebral column, where the processes are incomplete, contains within the medullary substance a serous fluid, which communicates with the fourth ventricle of the brain, so that pressure on the tumor will sometimes produce convulsions, and its evacuation sudden death. It usually therefore happens, that children labouring under these morbid appearances, are born dead, or are brought forth alive with a tumor, which ulcerates, and kills them soon after birth.

Among the numerous diseases arising from the *hereditary Debilities* of the fœtus, many make their appearance at birth, as happens in some instances of scrofula, while others do not shew

themselves for a considerable time afterwards, which is generally the case with those of the hearing and sight. *Deafness,* one of the most common congenital diseases of the organs of sense, is seldom discovered until after the time that children ought to talk, when they are always found dumb, from ignorance of sounds and letters. An hereditary disorganization of the nervous system, is in some instances the cause of the deafness of both ears after birth, whereas irregularities of growth in the internal parts of the organ produces it in others, but neither of these defects we are able to account for. The author knew seven adults, all children of a family in London, perfectly dumb, in consequence of their being born deaf; in none of them was there any apparent defect in the ear, the mother however was a nervous woman, troubled with dulness of hearing. He also knows a family of six children in Gloucestershire, who have severally a defect of speech derived from the mother, who lisps, although the organs have no unnatural appearance in any of the family.

In like manner, the *Blindness,* which is formed by some defect of the nervous system before birth, is not discovered until the usual time when the perfect functions of the eye are called into action; and the myoptic state of the eyes is sel-

dom perceived before three or four years of age. The blindness at birth from agglutination of the eye-lids, is rarely of any consequence; but that which proceeds from serous fluid compressing the optic nerves, is generally of the most fatal nature. *Cataracts* are not unfrequently found at birth, in a more mucous and fluid state than those of adult years; but there are seldom any attempts made to cure them before seven years of age, or a later period, when children become better acquainted with the value of the sense they are deprived of, and possess firmness of mind sufficient to undergo an operation.

Children are often brought forth *without signs of life*, owing to injuries received in time of labour, or to a partial distension of the lungs with air; hence they are readily recovered by artificial heat, friction, and inflation of the pulmonary organ, employed as soon as the *Asphyxia* is discovered. There are also many congenital defects of pulmonary circulation, frequently occurring from *Malformations of the vital organs*, which are not always immediately fatal, but are attended with a livid state of the skin, and imperfect powers of nutrition. Thus, the foramen ovale of the heart very often continues open after birth. At other times, the aorta is found branching off from the right ventricle of the heart,

instead of the left. But the most common occurrences are imperfect formations of the pulmonary artery, which do not permit the whole blood to enter the lungs. A singular instance of preternatural structure of the heart, is recorded in the Philosophical Transactions. The child lived ten days, with merely one ventricle, and one auricle to the heart, and the only sign of the derangement of the functions of life, consisted in the purple state of the skin*. In these malformations, the blood being imperfectly oxydated, children seldom live many days, although there are some instances of their lingering a miserable life till puberty, as in the case of Dr. Sandifort's blue child. We have reason to believe that many sudden deaths of very young children arise from unknown causes of this kind.

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* Phil. Trans. Vol. xcv. Part II. 1805.

CHAP. II.

DISEASES TO WHICH THE BODY IS PREDISPOSED IN INFANCY.

As the feeble spark of life is in greater danger of extinction in the incipient state of the organization, when newly exposed to the operation of external causes, than when the body has increased its firmness, and has acquired a stronger habit of action, diseases must naturally assume different characters, at the beginning and end of the infant period.

The First Epoch of infancy is an age of extreme debility, and is therefore charged with more than half the mortality of life; but the danger gradually decreases as the body grows older, and as the predispositions to disease change their character. Three different states of constitution, regularly succeed each other in this stage of life, and are attended with different kinds of

diseases. The acute sensibility of the internal and external surfaces of the body, in the earliest stage, predispose to the most fatal diseases, from the slightest causes. Next, the ossific process, fitting the body for progressive movement, is liable to be interrupted, and to become defective from want of vital energy, and from improper management of the body. And finally, the solids in their lax and infirm state, accompanied with glandular irritability, are attacked with a variety of diseases, from an acquired as well as an hereditary defect of vital powers.

These, as they appear to be the most general predisposed states of the period, shall be illustrated, by tracing the history of infantile diseases as they severally and successively occur.

I. The *acute sensibility of the surfaces* of the body, between birth and the end of the second year, dispose to the attack of a greater number of fatal complaints than occur at any after period.

The *Internal* surfaces are naturally in a weak state for several months after birth, since the stomach and bowels are scarcely ever free from symptoms of *Dyspepsy*. But these, in their simple state, cannot be considered as diseases, for many of them prevail in the healthiest children, and disappear spontaneously, as the con-

stitution gains strength. Thus, acidity depends as much upon the ascescent nature of the diet as it does upon the debilty of the digestive organ, and the acidity of infancy often proves a salutary evacuant of its superabundant intestinal secretions. In like manner eructations of wind, and pukings of curdled milk, have a tendency rather to relieve the stomach in a gentle manner from distension, than to injure the health in any way, and hence has arisen the common observation among nurses, that puking children always thrive the best.

But when acidity becomes so abundant in the first passages, as to occasion gripes, and frequent green dejections, a dangerous disease is always to be apprehended, since children have no powers of constitution to withstand excessive evacuations in the early period of lactation. The bowels at the same time possess so much sensibility, as to communicate their irritations, through the grand sympathetic nerves to the liver, to the cerebral organ, and to almost every other part of the infant system. We therefore find the *Diarrhea* called watery gripes, occurring often at the end of the second month; it is one of the most severe bilious diseases of childhood, and seldom continues more than eight or ten days without becoming fatal.

Many of the affections of the bowels are communicated through the whole surface of the body. *Aphthous Crusts,* of a white or brown appearance, take place in the mouths of children afflicted with bowel diseases, and extend their baneful influence through the canal, even to the anus. The *Skin bound disease* likewise attacks in the first year of infancy, from a morbid condition of the intestinal canal. The hard, tense, and cold state of the external skin, accompanying the disease of the bowels, are striking proofs of the intimate connection that subsists between the internal and external surfaces of the body, while the frequent termination of the disease by convulsions, shows how much the cerebral organ sympathises with the affections of early life.

Catarrhal Diseases, which are the most common endemics of Britain, begin to prevail at an early period of life. The pituitary membrane lining the nostrils, throat, and air tubes of the lungs, at the time of its greatest sensibility, and the very feeble state of the whole respiratory organs, dispose the infant system to frequent attacks of sneezing, wheezing, cough, and oppressed breathing. But *the Croup* is the most dangerous disease of these organs, on account of the straitness of the larynx, which in early infancy is not half so wide as it is after puberty.

The disease therefore prevails with greatest malignity in moist states of the weather, when relaxation and debility favour the formation of the membrane which constricts the opening of the pulmonary passages, and induces the shrill and forcible intonations that characterize the disease. In like manner the *Lungs* are subject to *Inflammations*, and the numerous large glands of the bronchia secreting copiously in children of the first age, always bring them into a state of imminent danger, when the pulmonary system does not possess strength sufficient to expel the load of humors that oppress it.

Difficult Dentition is more generally fatal than any other disease of the early period. The teeth having acquired a certain size and ossification, between the fourth and eighth month, always produce more or less irritation in the mouth, which encreases the discharge of saliva, and produces painful swelling of the gums. But in many irritable children these hard bodies meeting with resistance, induce a degree of inflammatory action combined with debility, and ulceration of the gums. By pressing upon the nerves that enter their roots, they occasion so much pain, as to bring the bowels, skin, lungs, and brain, into general sympathy with the state of the mouth. A degree of danger then arises, which is always

proportioned to the weakness and irritability of the habit, but it very seldom happens, that difficult dentition does not arrest the encreasing strength, and retard the growth of the whole infant system.

Diarrhea takes place as a natural effort of the constitution to lessen this irritation, and the numerous eruptions and humors which appear on the skin, may have a similar tendency, but they are not sufficient at all times, to prevent the communication of the irritation by the diaphragmatic nerves to the chest, nor by the facial ones to the brain, so that dangerous states of dyspnœa, and convulsions, are liable to supervene; and in defiance of the most skilful treatment, this state of the first dentition too often kills children, in a direct manner, or leaves their constitution a prey to diseases, which prove fatal in succeeding periods.

Nothing is more common than for *Palsy of the lower Limbs,* called by nurses cutting the teeth in the loins, to succeed difficult dentition, and for curvatures to commence at the same time in the bones, which are often imputed to accidents, incurred by the neglect of the nurse, although they arise solely from the debility induced by dentition.

Convulsions are so frequent in this age of sen

sibility, that they attend almost every one of its diseases. Those however, which arise from difficult dentition, and affections of the bowels, are by far the most common. Sometimes *slight Spasms* only appear, like smiles on the faces of children in their sleep, perhaps from costiveness or some trifling affection of the bowels; at other times their limbs are seized with cramps, which subside spontaneously, or by rubbing them with a warm hand; but, the *Trismus* that attacks the jaws and face, sometimes before the ninth day after birth, and generally before the end of the second month, is a species of tetanus, peculiarly fatal in tropical climates, where spasmodic diseases are always most violent. In our own country, however, those convulsions in which the eyes are half shut, with the globe drawn upwards, called *Inward Fits*, terminate life, frequently in less than twenty-four hours, in consequence of the irritation of the teeth upon the acute sensibility of the nervous system in the beginning of life.

The *external* surface of the body is another principal source of infant mortality. The skin endowed with great vascularity as well as sensibility, is subject to serous humors, in the fluid state of early life. Dentition seldom occurs without occasioning *Watery Humors* from behind the ears, and the whole lactescent period is

affected with various exudations from the skin, which cannot be considered in any other light than as depurations of the system, driven by the laws of nature to the surface of the body, and are therefore generally attended with danger, when repelled. The author has more than once seen the hydrocephalus induced, by drying up watery humors from the neck and ears of infants, with desiccating applications, which would have readily yielded in a safe manner to frequent ablution of the parts, with only simple water. The *Milk Crust*, which appears on the faces of children at the breast, is merely a serous humor desiccated by the atmosphere into broad pustules, and is therefore a disease differing little from the scald head, except in situation, and in the time of its appearance.

Purulent Opthalmia invades immediately after birth, and with so much inveteracy, that the acrid discharge of matter which takes place from the eyes, sometimes occasions inversions of their lids, or destroys the globe itself. This has of late given rise to an opinion, that it originates in venereal poison, especially as it occurs most commonly among the lower orders of society. It has long been considered, on account of its early appearance, as arising from colds caught in time of labour; but the author having met with two cases

of it in children of three and four years of age, he cannot attempt to explain the state of the system which disposes to such a severe disease.

The delicate and vascular state of the skin, render it extremely susceptible of eruptive and infectious diseases. Dr. Willan describes various papulous eruptions, under the name of strophulus, as occurring in successive crops upon the face, neck, and superior parts of the body, between birth and the end of the first year, but are seldom attended with much constitutional affection, unless when repelled. These are all symptomatic, and the tendency to them is greatest immediately after birth. Thus, the *Red and Yellow Gum*, which differ little from each other, except in colour, are distinct papulous eruptions, that make their appearance at birth, and seldom after the second month, most probably from some affection of the bowels, although other physicians found an opinion upon their early appearance, that they are connected with the state of the liver, in consequence of the changes induced by the division of the chord. Certainly, the *Jaundice* of new born children is of this kind, for it disappears when the bile begins to flow regularly, or yields readily to gentle purgatives.

Erisipelas often appears about the navel and superior parts of the body, between birth and the

sixth week. It is attended with some degree of fever and pain, as well as hardness and redness of the skin. It often terminates favourably in eight or ten days, and at other times the redness becomes purple, and terminates in death, before any slough takes place.

Another set of eruptions make their appearance between the fourth and tenth month, which are symptomatic of the irritation of the teeth, and are therefore called *Teething Rashes*. These, instead of being attended with pain, or danger, rather appear to afford a critical relief to the internal irritation of the system.

The skin is remarkably susceptible of exanthematous infections at this age, and the action of the cuticular arteries, naturally increased in the spring and autumn of the year, favours their appearance more particularly at these seasons. Although the *Small Pox* and *Measles* appear at all ages, when the contagion is applied to the body, yet they most readily attack the early and susceptible states of the constitution, soon after lactation. *Scarlatina* and *Hooping-cough*, however, from some unknown law of the animal economy, are often postponed to more advanced years, notwithstanding they are fully as contagious in their nature as the others, and many persons escape their ravages altogether.

II. The *process of ossification* is extremely liable to become defective, between the second and fourth year of infancy, as appears from the frequent rickety symptoms of the age, which at times commence so early as the end of the first year, in cases of difficult dentition.

Rickets, are a disease readily called into action, by any causes which encrease the natural debility of this early period. The vital power, in this case, does not deposit a sufficient proportion of the phosphate of lime into the cells of the bones, to give them stability, their essential character. The animal functions are then disturbed, as the bony fabric does not keep pace with the growth of the rest of the system. But this does not appear to happen from the want of ossific matter in the body, as we find it at the time passing abundantly by the urine*, it may more properly be said to arise from the defective application of the ossific matter, to the last formed parts of the bones, from want of vital energy in the vessels,

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* Neither the urine of children, nor that of nurses, contains any great quantity of the phosphate of lime during the time of lactation, as it is employed in consolidating the bones, but it becomes abundant in the urinary secretion, when the bones cease to appropriate it to their own formation.

and of course, the indurated parts of the system which have fewest vessels and nerves, suffer most from the disease. There arise enlargements of the head, and joints of the body, prominent chest, projecting spine, crooked pelvis, curved limbs, swelled glands, tumid belly, and a wasting of the other parts of the system. These are frequently announced by a slow growth of the teeth, producing late dentition, and by the fontanelle of the parietal bones continuing open after two years of age. The skull is found at times so thin, that the osseous part can scarcely be distinguished from the membranous fontanelle. Indeed, the whole skeleton of a rickety child, notwithstanding the enlargement of the bones of the wrists, and ends of the ribs, is much lighter than that of a healthy one of the same size. Rickety diseases being slow in their progress, are not immediately fatal, but as they attack the solid foundation of the body, and occasion confinement of the viscera, they tend to a fatal termination in the subsequent part of the infant period.

The *Confinement of the Thorax* is one of the most common consequences of the rickety habit, and it becomes more dangerous as the encreasing deformity from incumbent weight, renders the breathing more difficult. The sternum pro-

jects, and the ribs flatten, which encrease the prominence of the belly, by forcing the viscera downwards. The lungs appear of a small size, either from their confined situation, or from their defective growth, by the inefficient condition of the vital powers.

The *Hydrocephalus* of this period, differs considerably from the dropsy of the head, found at birth, as the water is now deposited, only in small quantities, in the ventricles of the brain. It has been classed by Dr. Cullen as a serous apoplexy, but it is a disease of slow formation, and takes place in a different texture of brain from the apoplexy of adults. Thus, we find the posterior part of the cranium somewhat enlarged from birth, either through an original flabby structure of the cerebral organ, or from want of ossification to restrain its growth. The bones of the head are thereby widely separated, and the membranes continue unossified at the fontanelle. But the fatal symptoms of this disease seldom appear before the third year of infancy, neither do they occur after puberty, when the brain has acquired greater density, and the rest of the body exceeds the size of the head in relative bulk.

The author never witnessed an instance of the cure of hydrocephalus, after the dilated pupils,

squinting eyes, pain of the head, and symptomatic fever, indicated the presence of water in the ventricles. He uniformly found the disease terminate about the twenty-first day, from the acute attack, but he has met with some cases, in which the threatening disease has been prevented, and as this is a disease which is hereditary, and often destroys all the children of particular families, it may not be inexpedient to mention an instance of prophylactic success. A Mr. Harris, who had lost two of his children by hydrocephalus, as related by the author, in the Memoirs of the Medical Society of London*, had two remaining children of scrophulous habits and large occiput from birth, taken ill at six and seven years of age, with incipient symptoms of acute hydrocephalus. The appearances of the disease were immediately removed by drastic mercurial purgatives, and by large vesicatories applied to the vertex of the head. The repetition of this practice, at short intervals, brought them both to the age of puberty.

III. A state of *laxity and glandular irritation* is liable to prevail between the fourth and twelfth

* Mem. of Med. Society, Vol. III. p. 414.

year of infancy. Its influence at times extends even beyond the age of puberty. The glands, naturally the weakest part of the lymphatic system, having fewer nerves than most other structures, possess less vital power, and are more obnoxious to injury from debilitating causes.

Scrofula has been ascribed to an acrimonious or tainted state of the circulating fluids, but we know these are continually renewed, in very short spaces of time, more especially in early life, when this disease occurs. It evidently takes place from a lax condition of the solids, accompanied with a tendency to derangement in the lymphatic system, which may either be an acquired state, or arise from hereditary stamina. We therefore find the temperament that disposes, to the disease, to consist in a fair florid complexion, light coloured hair, large blue eyes, dilated pupils, soft skin, and delicate habit. And this state of constitution, for the most part can be traced to one or both parents, or to some of their progenitors.

When the disease appears in the scrofulous temperament, it assumes different forms, according to the state of particular organs in individuals; and it does not complete its course for a great number of years after the attack. Few parts of a human body escape its ravages, at some

age or other. In early infancy, obstructions arise in some instances in the lacteal vessels, and mesenteric glands, or ossification proceeds slowly in the bones; and in other cases, humors of the skin, and swellings of the upper lip, only appear. But in the latter part of the period, we more frequently find inflammations of the eyes, ulcers of the eye-lids, humors of the neck, swellings of the muscles, caries of the bones, and curvatures of the spine taking place. And in adult years, swellings of the thyroid gland, and pulmonary consumption, are its frequent effects. But this disease is seldom attended with immediate danger, unless it attacks the internal organs of the body, and brings on hectic fever. And in illustration, we need only recite two instances of its most dangerous states, at periods of life considerably distant from each other.

The *Infantile Hectic* is a remarkable atrophy, which occurs in the first epoch of infancy, and sometimes commences so early as the second year of life, from difficult dentition. The hard and swelled state of the belly occasioned by obstructed glands, is generally followed by marasmus of the rest of the body, while perhaps the appetite continues at the same time in a keen state. The glands of the mesentery, naturally large and turgid in infancy, encrease little through

life, while all the other parts of the chylopoetic system are growing larger; but in rickety and scrofulous children, these channels of nutrition are often plugged up with gelatinous and calcareous substances, which produces swelling of the belly, without much pain: at other times the glands will become as large as walnuts, and still continue in a permeable state; but in both cases they are liable to induce the hectica infantilis, known by paroxysms of fever, flushed face, and purgings of chylous matter, or undigested food, which waste the body, and generally terminate fatally.

In like manner, the foundations of pulmonary consumption are frequently laid in scrofulous habits at this early age, by the generation of *Tubercles in the Lungs.* They begin to form in small white bodies, like mucous glands, in children of three or four years of age, and grow gradually larger and more numerous, until the age of maturity, when they readily inflame, and occasion hæmoptoe, or ulcers of the lungs, in the period of pulmonary evolution. In such cases, symptoms of hectic fever, not very dissimilar to those proceeding from diseased mesenteric glands, generally close the fatal scene.

The SECOND EPOCH of infancy is the healthiest æra of life, yet it has its peculiar diseases, arising from the continuation of Nature's work upon the skin, bones, and glands.

The skin, still comparatively replete with vessels and juices, continues to produce *Cutaneous Humors* in the second epoch of infancy, as it did in the first, and more particularly in scrofulous habits. We have elsewhere observed, that the first part of the period is subject to exudations of moisture, in the wrinkles of the neck and groins, of fat children, and at other times disposed to form serous discharges from behind the ears, in the time of dentition. The same tendency to humors continues in this epoch, with an increased disposition to their desiccation. They must, therefore, like the former humors, be considered, as depurations of the system, which cannot with safety be repelled. The healthiest young people are subject to copious secretions from the glands of the joints, particularly of the arm-pits, and other places kept in a state of warmth. Perspiration also from their feet, and the moisture from the follicles at the roots of the hair of their head, is liable to acquire a sour smell. Nay, the latter generates *Pediculi* to a dangerous degree when cleanliness is neglected. In like manner, many scaly, brawny, and crusty diseases of

the skin are formed at this time of life, from the desiccation of superabundant serous humors by the atmosphere.

Various eruptive diseases named porrigo, pytyriasis, and psoriasis by Dr. Willan, prevail in this age, but we shall only instance a familiar one, in illustration of the subject. The *Tinea Capitis* appears at first as spots of a brawny scurf, which soon form into small ulcers at the roots of the hair of the head, and terminate in white crusts of a contagious nature. These appear between three and ten years of age, more particularly among the children of the poor, who live in habits of nastiness. The disposition to this humor, vulgarly called scald head, is so great, that it is prone to frequent returns after it has been removed, and therefore becomes extremely difficult to cure.

The same humoral predisposition sometimes extends to adult years, particularly in females, who have always the most fluid structure. The author has seen humors excoriate the neck and ears of ladies, to a greater degree than those which affect young children. But the most remarkable instance of this kind, is one that may occur either before or after puberty, called *Plica Polonica,* in which an acrid matter penetrates the tubular part of the hair, and brings on inflam

matory fevers and ulceration of the scalp. The clammy discharge glues the hair together, and terminates in a fœtid, painful, and contagious disease. It is most prevalent among the young women of Poland and Germany, who encourage the growth of long hair, and are inattentive to cleanliness.

Worms may be considered as an excrementitious humor of the intestinal canal, to which the second epoch of infancy is peculiarly obnoxious; and probably, like the gentle diarrhea of the lactescent period, they may originate in an effort of nature to rid herself of a greater evil; but it is at the same time true, that when they become abundant they produce a troublesome disease.

Erisipelas cannot be considered as depuratory of the system, although it is not an uncommon appearance of the age. It differs from the disease of the same name in adults; for the redness, swelling, pain, and moisture of the skin, are liable to extend themselves from place to place, such as from the face to the eyes and ears, and from the external to the internal parts of the body in infancy, whereas the disorder has a greater tendency to become putrid, and to be limited in its extent, when it attacks after the meridian of life; not from any peculiarity in the nature of the disease itself, but from a difference in the condition of

the skin, and of the living powers of the system at these ages.

A disposition to *Warts and Tetters* on the hands and face, prevails in young people before puberty, from the strong action of the cutaneous vessels, and their tendency to elongation in the growing state of the body. A similar state of the extreme parts of the body explains the appearances of *Whitloes*, particularly in the spring of the year, and of *Chilblains* in the cold of winter. This last is a principal endemial disease of Britain among young people, and is very much connected with the defect of vital power which attends the delicate and scrofulous habit. It has therefore been remarked, that children who have been scrofulous in the early part of this period, and particularly females, are most liable to these inflammations of the hands and feet in the second epoch of infancy, especially when they come to sit many hours benumbed in a cold school-room.

The *Mumps*, a tumefaction of the skin and cellular membrane of the fauces, and sometimes of the female breast, appears most commonly in pubescence, and frequently long after puberty; but it is an epidemic disease of little danger, although generally attended with some degree of fever.

Rickety and scrofulous diseases are often continued in the second epoch of infancy with increased

force, which is particularly observable in their depredations upon the bones of the vertebral column, and the glands of the neck.

Thus, *Curvatures of the Spine* may occur at all ages, but their general appearance is between the third year of infancy and the period of manhood, and so greatly do they injure the general health, that they may be discovered in the face, by the sharpness of the countenance which accompanies them. The spine nearly straight in the fœtus, forms itself into regular concavities, which become more arched through life. But in weakly constitutions, especially when sedentary habits, and improper positions of the body concur, the healthy form of the column is destroyed by rickety softness, and scrofulous ulcerations, which become extremely fatal, both before and after puberty.

Softness of the bones of the Thorax, the most usual occurrence of this kind, injures its contained viscera, and thereby induces a general emaciation of the body. The spinal processes become prominent, the dorsal muscles lank, and the breathing laborious. In the progress of the disease, one curvature begets another, from the efforts of the patient to replace the head upon the centre of gravity, and the stature is thus so much diminished as to make the extremities appear uncommonly long, in proportion to the

trunk of the body. But as growing viscera have a tendency to accommodate themselves to their situation, prognostications can only be formed upon general principles. An acute angle, by the projection of one or two vertebræ only, or a curvature situated upon the left side of the body, must be more dangerous than extensive inflections, or those situated on parts of the spine, which interfere less with the actions of the heart.

Wry Neck, accompanied with some degree of pain, is not an uncommon curvature, in children of this age.. The distortion of the head, by muscular spasm or fever, is seldom of long continuance, and even the permanent contraction of the mastoid muscle, drawing the he d aside, admits of ready cure by division of that muscle: but the contractions which arise from curvatures of the vertebræ, in consequence of rickets, or of improper positions in early infancy, are liable to distress persons through a long life.

Those weakly children which have large blue eyes, and soft skin, are subject to *Strumous glands of the neck*, about eight or ten years of age. The tendency, however, to these swellings, gradually declines towards the age of puberty, and ceases to exist in adult years. Swellings often appear in the conglobate

glands of the neck, as large as a walnut, which have little pain or disposition to suppurate, and when they happen to ulcerate, they will continue in the same state for months, or even for years together, and heal spontaneously as the constitution gains strength, without leaving any vestige of disease, except their scars. But at other times, the swellings will disappear, and new ones succeed in the same places; or the morbid actions will take a new determination to the lungs, in the period of pulmonary evolution.

Cretinism, a distressing disease of both males and females in infancy, is endemial in the Valais of Switzerland, and mountainous districts of Germany, among the indigent poor, and those who live in their valleys, excluded from the rays of the sun, and loaded with moisture. It becomes hereditary in such situations, and the debilities of the parents operate upon the early state of the infant structure. We, therefore, find soon after birth, symptoms of defective vitality, similar to those which occur in rickets, such as deformed head, open bregma, slow dentition, and swelled joints: and these are soon followed by scrofulous appearances, such as flabby muscles, swelled abdomen, and glandular enlargements. A swelling of the thyroid gland, called *Bronchocele*, generally increases the deformity, and becomes

most remarkable towards the time of pubescence, but the most afflicting circumstance of the disease is, an imbecility of mind, which often sinks into perfect idiotism.

Stone of the bladder is not uncommon in this epoch, in consequence of the superabundant quantity of uric acid and lime contained in the urine, as well as the tendency of the age to favour the hereditary appearance of the disease. It has, however, always been remarked, that children recover more readily from the operation of lithotomy than adults, in whom the system of vessels has a more vigorous action.

Incontinence of Urine, is a common occurrence at this age, and will continue in some females beyond that of puberty. Eneuresis, if proceeding from debility of the sphincter of the bladder, will often disappear as the body gains strength, but when it arises from habits of laziness in the night, shame, and corporal correction, are the only means of obviating it.

The diseases of the nervous system, which were symptomatic, and suddenly fatal, in the beginning of life, now assume more of the idiopathic form, yielding readily to the growth of the body, and its increase of strength. Thus, *Night-mare* and nocturnal terrors, are not unfrequent,

between three and ten years of age. Children awake suddenly from their sleep with exclamations, and continue afterwards insensible for several minutes, arising as frequently from the irritation of the intestinal canal by worms, communicated to the brain, as from hurried circulation of the blood, or topical affections of the head.

St. Vitus's Dance attacks between the fifth year and puberty, and sometimes later. This spasmodic disease of the extremities seldom proves fatal, and often disappears after a few months, even without remedies. But, at other times, it is extremely difficult of cure, and will continue until changes take place in the nervous system, at the period of full growth, under every kind of treatment.

A Myoptic state of the eye is natural to infancy, and the causes of it being the two great convexity of the globe, it gradually cures itself, by age. Sometimes the shortness of sight in children is confined merely to the indistinct vision of objects at a few yards distance, and does not affect their ability to read in the usual way. But when the sight happens to be so short, as to prevent their seeing print at a greater distance than eight or nine inches from the eye, and when it is attended with a winking state of the eyelids, it must come under the denomination

of disease. These states of the eye are generally hereditary, but they are also at times acquired, by habits of looking too closely at objects, which sometimes happens to girls who keep their needle work close to their faces. These may be remedied by establishing a contrary habit of observing distant objects. Concave glasses are often used with good effect in these conditions of the eye, and may be discontinued as the sight improves; they, however, are indispensably necessary when children learn to draw landscapes from nature.

Squinting often prevails at this age, from unequal force exerted by the muscles of the globe, or a habit of moving the eyes in different directions. When, however, strabismus arises in children from their using one eye more than the other, as sometimes happens to those who are suckled with one breast only, it may be removed by practising a contrary habit; but when it happens from congenital defects, as from contraction of the muscles of the globe, or an oblique position of the crystalline humor, &c. it is likely to continue from birth to the end of a long life. As children are apt to trust only to the sound eye, and neglect entirely the use of the defective one, it has been recommended to cover the former for a certain time, in order to render the latter useful, by the power of habit.

CHAP. III.

DISEASES TO WHICH THE BODY IS PREDISPOSED IN YOUTH.

NOTWITHSTANDING the danger which the ancients ascribed to the changes of puberty, this period is remarkable for exemption from diseases, when the rickety and scrofulous states of constitution are not transmitted to it. No doubt every kind of sudden development must alter the disposition of parts, and have a tendency to render the body more irritable, as well as more sensible to external and internal impressions; but the changes of puberty being much greater than any others after birth, are accompanied with an accession of tone, both of body and mind, peculiar to the period; we therefore find many diseases which originated in the debility of former years, especially those of the spasmodic kinds, disappearing spontaneously at this time, and fresh sympathies arising that give a new di-

rection, and stronger impulses to the energies of the system.

The diseases of the FIRST EPOCH of youth, succeed each other in the order in which the principal organs of the body complete their growth. The favourite doctrine of the celebrated Cullen, with respect to the hœmorrhagic efforts of the system in its different periods, which was founded upon the physiological opinions of Baron Haller and Sir Clifton Wintringham, supposes, that in the growing period of life an arterial plethora prevails, and the vessels then yield to the force of the heart; but on account of a gradual increase of density in the coats of the arteries towards the completion of the growth of the body, they begin to resist further elongation, and at length throw the balance of blood entirely upon the venous system. His inferences from this hypothesis are, that the head being first finished, the resistance to the blood commencing in the brain, produces a tendency to hœmorrhages from the nose, about the time of puberty. The blood being next determined to the lungs, produces a disposition to hœmoptisis, on the approach of the body to its acmé, and more especially when the capacity of the pulmonary

organs is not in perfect unison with the rest of the system.

In like manner, the venous plethora which begins to take place after thirty-five years of age, from the increased density of the coats of the arteries over that of the veins, produces hœmorrhages from the hœmorrhoidal vessels soon after that age, and in the latter stages of life occasions a plethoric state of the cerebral veins, unassisted as they are by the action of the muscles*.

But we are not disposed to consider either growth, or the diseases accompanying it, as depending upon an unequal balance in the distribution of blood, which might ensue if the body were an hydraulic machine; we rather ascribe them to an active principle accomplishing the growth of the different parts of the system, nearly in the same order of succession that took place in the first formation of the embryo, in consequence of a particular law of life, which, as we have elsewhere acknowledged, can not be explained. And although the Cullenian hypothesis of density in one part, determining blood to others of less resistance, is not a satisfactory explanation of the growing process, which depends on the activity of capillary arteries, and on new

* Cullen's First Lines, Vol. II.

sympathies arising in the different ages, yet the facts adduced in support of it, certainly occur in the order of time in which the doctor has represented them, as appears from the writings of all authors since the days of Hippocrates. We shall therefore trace the predispositions to diseases in the head, thorax, and pelvis.

Epilepsy manifests a greater connection with the changes of the body than most other diseases, and although it may not disappear at puberty in a number of instances, yet its movements, like other spasmodic diseases, are frequently disturbed by the changes occurring in the nervous system at this age, and it is always a consolatory prospect to the afflicted and their friends, that a disease so little within the power of remedies has a degree of tendency to cease spontaneously towards the period of full growth. But when epilepsy continues beyond, or commences after, the age of puberty, it proves extremely obstinate, and too often terminates in an imbecile state of mind, or a fatal apoplexy. The sudden falling to the ground in a state of insensibility, succeeded by external and internal convulsions of the muscles, can only arise from a particular condition of the nervous system; and this may be further inferred from the tendency of the paroxysms to invade the body between its sleeping and waking states, and from the effects of moral

causes, as well as of different organical affections of the brain exciting the disease. But what the particular state of structure is with respect to the density of the encephalon, cannot be well explained. We only know, that the same exciting causes which produce epilepsy in early life, are more likely to occasion apoplexy in elderly persons, from the difference of the firmness in the nervous system at these distant periods.

Bleedings from the Nose are of more frequent occurrence about the time of puberty, than at any other age. The extremities of the exhalent arteries which moisten the cavity of the nose, and are thinly clothed with pituitary membrane, pour forth a stream of florid blood, very different from the dark coloured drops proceeding from the nasal veins of elderly persons. The pains of the head, flushed face, itchings of the nose, and hard pulse, which so often announce the sanguineous irruption of this age, are indications that the epistaxis arises from increased action of the cerebral vessels. These efforts of nature must, therefore, be in general conducive to the preservation of the head against diseases, and are very seldom accompanied with danger at this age, however severe they may be.

When the growing process has ceased in the head, the thorax and lungs enlarge their dimen-

sions, and a strong action of their vessels predispose the body to spittings of blood, inflammations, and to the growth of tubercles—diseases which usually succeed to the age of epistaxis.

Hæmoptoe is at all times an alarming disease, but it is certainly most so between the ages of eighteen and thirty-six, the period of pulmonary evolution. In some instances which came under the author's observation, these hœmorrhages proved fatal on their first attack, by rupture of an artery in the lungs, producing suffocation. But in the greatest number of cases he met with, especially those occurring late in the period, the patient recovered from the first attack, but the spittings of blood returned in less than a year afterwards, and after two, or perhaps three seizures of the same kind, terminated in consumption of the lungs.

Pulmonary Consumption is the greatest enemy of the juvenile period. Notwithstanding phthisis arises from local causes, it is truly a constitutional disease, since its foundations are usually laid in the rickety and scrofulous states of the body, in early life, and this is the reason why very slight exciting causes bring the disease into action after the age of puberty, the time in which the greatest changes take place in the pulmonary system. We therefore find that soft bones and narrow

chest, accompanied with long nails, fine teeth, smooth skin, florid complexion, and pulmonary tubercles, are generally constitutional precursors of this endemic of Britain. After it has commenced, the appetite and digestive powers continue vigorous at the time the body is wasting from defective nutrition, owing to the destruction of the lungs, which are as necessary for assimilation as the digestive organs.

The destructive local affection of the lungs is seldom attended with pain proportionate to the injury the organ sustains, as nerves cannot be traced to every part of the bronchial cells; the nerves of the organ, however, are sufficiently numerous to communicate irritation to the general system, and to occasion a set of symptoms peculiar to the disease. Thus hoarseness, loss of voice, increased action of the heart and arteries, particularly of the capillaries in the cheeks, hands, and feet, characterizes the hectic of phthisis, and depend more upon the connection of the pulmonary plexus, grand sympathetic, parvagum, and recurrent nerves, than upon any absorption of purulent matter into the blood; since in these cases the pus is for the most part discharged by expectoration*.

* Portal D'Anatomie Medicale.

The *Narrow Chest* is usually derived from the rickets of infancy, although instances are not wanting of its taking origin after the age of puberty. But there seldom exists a phthisical habit, without some contraction in the cavity of the thorax, for the lungs are often confined when the sternum appears neither prominent nor flat. The elevated and projecting shoulders, so often compared to wings, in consumptive habits, shew that the thorax is not sufficiently broad to contain the scapulæ, and that the superior part of the chest has not expanded in due proportion to the natural size of the lungs and heart. When we therefore find the thorax, which ought to be capaciously round, more elevated or less wide than common, the scapulæ projecting, the collar bones convex, the ends of the ribs swelled, and the chest thinly clothed with muscles, we have certain signs of a phthisical conformation of the thorax.

Tubercles of the Lungs, which usually originate in the fair, sanguine, and scrofulous habit, are frequent causes of fatal consumptions in this period, and most commonly in the following way. Small tubercles arise in the lungs, perhaps so early as the third or fourth year of infancy; they increase their number and magnitude with the increase of the body, so that they unite about the time of puberty into clusters; and at the period

when the body has attained its full growth, or later, they become filled with curdy pus, without much inflammation. Upon the application of exciting causes, they terminate in vomicæ, which are generally accompanied with cough, difficult respiration, emaciation of the body, and always with hectic fever: purulent expectoration at length consumes large portions of the lungs, and the lingering decline closes with colliquative sweats and diarrhea.

Secondary sets of scrofulous diseases frequently take place in the bony fabric, towards the time of the union of the epiphises, and the complete consolidation of the ends of the bones.

The *Hip Joint Disease* commences before or soon after puberty, with a lameness of one of the lower extremities; this the patient at first conjectures to have been occasioned by some trifling accident, but he soon afterwards learns the fatal nature of the disease, from the shortening and emaciation of the limb, succeeded by abscess at the head of the bone, and by hectic fever. The *Lumbar Abscess*, which also occurs in the youthful period, has often been confounded with the above mentioned morbus coxarius; but soreness to the touch, and a copious collection of matter, which in this disease the psoas abscess, extends down the thigh, indicate a carious state of the

vertebræ of the spine, or an inflammation of the membrane of the psoas muscle, and may readily be detected on examination by the surgeon.

White Swelling of the knee, is a disease in the ends of the long bones that destroys the structure of the joint, sometimes before puberty, and generally before thirty years of age. The ligaments and cartilages of the joint possessing little sensibility in their healthy state, are attacked with an inflammation, which affects the anterior branches of the crural nerve, and terminates in a most painful state of caries, and hectic fever. It seldom arises from accidents, and is most commonly preceded by some symptoms of scrofula; but if scrofulous action be not going on in other important places of the body, and if the constitution be tolerably sound, the patient's life is often saved by amputating the limb above the knee.

Spina Ventosa is a similar caries to the last, taking place in the ends of the bones of the elbow and wrist, and likewise attacks about the same age; but it admits of a cure without amputation, as the patient can take exercise in the open air without aggravating the disease by motion of the joint, and pressure of incumbent parts.

In the SECOND EPOCH of the juvenile period, diseases of the generative system and pelvis, frequently occur. The general tone of the system is so much connected with the state of the genital organs, that considerable danger attaches to this period, when turgescence of the seminal vessels in males, and irritation of the ovaries, and of the uterine system in females, impart a wrong tendency to the operations of the mind. The *Syphilitic Disease*, for instance, kills great numbers in the prime of life, destroys the comforts of the matrimonial bed, and transmits morbid predispositions to declining years. To conceal the effects of imprudence, inexperienced youth permit desperate quacks to surcharge their habits with mercury, which, in the variable climate of Britain, is liable to induce the most fatal inflammations, and pulmonary diseases, and to these they fall victims, without creating in their family the smallest suspicion of the real cause of their death.

Tabes Dorsalis is another disease of the most distressing and dangerous nature, which is common among the youth of the present day. The habits inducing it commence while they are yet at school, and are ignorant of the misery they are likely to entail upon themselves, for the remainder of life. Debility, emaciation, stupidity,

depression of spirits, impotency, and epileptic fits, are only a few of the many deplorable effects arising from sensual practices, and sexual intemperance, especially when committed before the body has attained its due consolidation, at the period of full growth.

Females are more subject to diseases immediately after puberty than males, on account of the extensive influence the uterine system acquires over both the body and mind. We believe that the state of the ovaries has a principal share in producing constitutional irritation, since their vascularity and irritability are greatly encreased by the changes of puberty, and they are oftener found in a state of morbid structure, than the other parts of the generative organs. But the uterus and other sexual structures, of equal importance to the economy of the female system, likewise increase their turgescence and irritability at the same time with the ovaries, and thereby predispose to a multitude of diseases, between the sixteenth and twenty-fifth year of life, particularly in unmarried females.

The sanguineous evacuation, the ultimate object in the mechanism of the female body, by preserving a prolific state of the uterine system, is in great measure dependent upon general as well as local plethora, as appears from the livid

circle surrounding the eyes, and the tumefaction of the breasts, which so generally announce its evolutionary periods. And it is a remarkable fact, that the slow sanguineous effusion of only five or six ounces, in the space of three or four days, is of so much importance to the female constitution, that the slightest deviations from the habit, are destructive of health. Symptoms of a similar kind arise, from a defect as well as an excess of that evacuation, since we find that a pale complexion, disordered stomach, hysteric passion, and a state of general debility, are common to uterine affections, and that the same use of tonic remedies is required for the one, as for the other state of the system.

Chlorosis supervenes between the sixteenth and twenty-fifth year, especially when the catamenia are not regularly established; and it is liable, on most occasions, to induce an almost exsanguine state of the body. *Menorrhagia* likewise occurs between the sixteenth and twenty-fifth year, much oftener than at any other age. And *Hysteria* most commonly makes its appearance between puberty and thirty-five, more especially in the delicate lax habit of single than of married females. But all these atonic and morbid states, arising from uterine derangement, become less frequent, after the age of twenty-five,

when the vigour of the youthful period begins to suffer some degree of decline.

Deformity of the Pelvis is a particularly destructive disease of married females, as well as of their offspring, in this period. The rickets of infancy, and the erect posture peculiar to the human female, prove great sources of her mortality. The whole weight of the body in its sedentary posture, resting upon the base of the vertebral column, when the bones are soft and yielding, occasions a projection of the sacrum internally, at its union with the last vertebra of the loins, and frequently also of the other bones of the pelvis. This being once established in early infancy, can seldom be removed under the circumstances of increasing pressure, in future years. We therefore discover in the time of the first labour, that the aperture of the pelvis, which ought to be four inches from the sacrum to the pubis, has contracted to two inches, and sometimes to one only, so that it is impossible that the head of a living child can pass at the full period of uterine gestation, and therefore the life of the mother is endangered, at the time the child is destroyed.

In like manner the general softness which arises in the bones of some adults, after the fabric has received its consolidation, occasions a deformity of the pelvis, more fatal than the rickets of

infancy. The *Molities Ossium*, however, is very fortunately a rare disease, and more frequently occurs late in life than in the period of advanced youth. From some morbid excitement of the absorbent system, the earthy particles of the bones are carried into the circulation, and discharged by the urine, the bones of consequence become flexible and curved, which soon destroy all the functions of life, and remove the unfortunate victim from a state of absolute misery.

CHAP. IV.

DISEASES TO WHICH THE BODY IS PREDISPOSED IN MANHOOD.

ALTHOUGH there are no remarkable evolutions of organization, in this steady period, yet it has its peculiar predispositions to disease, which arise chiefly from an increased tone of the vascular system, and density of the structure of the organs. This plainly appears from the number of inflammations, schirrosities, and mental diseases, occurring more frequently in this than in the other periods of life. But, at the same time, it must be understood, that the mortality of the period does not arise so much from any particular condition of the organization, as it does from the abuses of constitution, and the accidents of life which assail this vigorous period.

The FIRST EPOCH, the meridian of life, is subject to numerous inflammations, which are of a phlegmonous nature in the beginning, and of the erisipelatous kinds in the end, of manhood.

Morbid Corpulency is not an uncommon plethoric state of this age. The natural tendency to the separation of oily particles from the blood, in some persons more than in others, can no more be accounted for than the difference of stature and size among animals. But the circumstances which favour its accumulation, when the predisposition towards it exists, are tolerably well ascertained. Thus, coldness of climate—oily nutritious aliment—malt liquors—indolent habits—tranquillity of mind—and long periods of sleep, are the usual causes of corpulency; but they are more liable to produce it, after the body has accomplished its lateral growth, from a new appropriation of superabundant nutriment, than at any other time of life. Hence the omentum, which in children is so small as scarcely to reach the umbilicus, extends, in adult years, over the whole abdominal viscera and is loaded at the same time with fat. In old age it becomes lean and so pendulous, as frequently to fill the sac of inguinal hernia.

Many exciting causes combine with hereditary predisposition to produce the disease *Polysarcia*,

much oftener in England than in any other country of the world. In a great number of instances the abundance of fat, pressing upon the sanguiferous system, diminishes the diameter of the vessels, weakens the pulse, drives the blood from the surface of the body to the lungs and head, and thereby occasions difficult respiration and lethargy, which not uncommonly terminate in dropsy or apoplexy. This disease, always difficult of cure from the inactivity it begets, has been known to increase in some persons who have been in habits of violent exercise; but it is the author's opinion, that in every case, polysarcia might he removed by rigorous perseverance in a low vegetable diet, conjoined with constant exercise; and this sentiment receives confirmation from the rare appearances of immoderate corpulency among the laborious poor.

Inflammations of the Throat and Chest are not uncommon assailants of life after twenty-eight years of age. Any stoppage of perspiration, or sudden exposure of the membranes of the fauces and trachea to extremes of weather, will subject the pulmonary passages to inflammations, which will be more readily induced, and of a more violent nature in this, than in any other epoch of life. But *Pneumonia* is by far the most fatal inflammation of the period, particularly in

the winter season among the poor of the metropolis, as the author had frequent opportunities of observing, while he was physician to the Old Finsbury Dispensary.

Adhesions of the Pleura, the most common terminations of pneumonic inflammation in this country, are discovered on the dissection of almost every adult body, and are in general of so little consequence, that there are often no symptoms which indicate their existence during the life of the patient. But *adhesions about the heart* are often of a highly dangerous nature, by impeding the motions of that active organ. Two young men, patients of the Finsbury Dispensary, having only walked several miles very quickly, in the sultry weather of July, were seized with pain and inflammation of the chest, from which they never perfectly recovered. One of them died of a pneumonic disease in the subsequent winter, and the other a year afterwards. In both cases the vital organs were found on dissection, glued together by very extensive adhesions.

Inflammations of the membranous viscera of the abdomen are painful diseases, which, in many instances, prove fatal at this age; and the higher they are situated in the alimentary canal the greater the danger becomes. Thus, general *inflammation of the stomach* is one of the most fatal, and

painful diseases of the trunk of the body, on account of the numerous vessels, and the acute sensibility of the organ, in their highest state of excitement; but, on the other hand, many of its partial inflammations are attended with little pain, since very frequently ulcers, and sometimes round perforations of its substance, have proved suddenly fatal, and their existence was discovered only by the inspection of the body after death.

In like manner *Dyspepsia and Hematemesis,* which are principal causes of the mortality of this period, are unfortunately seldom attended with pain sufficient to warn persons against their insidious and fatal progress. They are certainly not the natural result of any state of organization peculiar to the period, although they prevail universally in meridian life, from the intemperate habits of mankind. The auth[illegible] observed forty years ago, how much more frequent both these diseases were on the books of the Royal Infirmary of Edinburgh, at the time when whisky was cheap, than he eve· saw them in any hospital of London.

Inflammations of the Intestines occur at all ages, but they are more generally destructive in this, than in other periods of life. The numerous anastomozing vessels, and the acute sensibility of the superior part of the alimentary ca-

nal, occasion these diseases to proceed rapidly to a state of gangrene. Whereas, the large intestines, by being less sensible and vascular, are more liable to be attacked with scirrhus, and ulceration, and to receive injury from the remora of their contents, by possessing no peristaltic motion like the small intestines. These floating viscera are likewise subject to *Displacements*, *Strangulations*, and *Colics*, from the various hurtful trades, and violent exertions peculiar to the period of manhood.

Inflammations of the Kidneys occur frequently in this epoch, but are attended with less pain and fever, than other internal inflammations, on account of the few nerves which supply the kidneys. Bloody urine, a very common symptom of nephritic complaints, frequently passes without the rupture of vessels as in putrid diseases; and this fact receives illustration, from the facility with which injections pass from the emulgent arteries into the veins and ureters, in making anatomical preparations. But those nephritic symptoms, which arise from gravel and ulcers of the kidneys, must be classed among the predispositions of old age, as they occur most frequently in that period.

Acute Rheumatism is more an inflammation of this period than of any other. The ligaments

and cartilages of joints, subject to constant friction and pressure, are not endowed with many nerves, and therefore possess little sensibility in their natural state; but when they become inflamed, and the skin of the knee-joint, for example, is rendered tense, the branches of the anterior crural nerve plentifully clothed with cellular membrane and blood vessels, they frequently occasion the most tormenting pains.

Atonic Rheumatism of the muscles, is still more frequent in manhood than the acute disease. The obtuse pains shifting from place to place in the trunk of the body, in consequence of a communication between the phrenic, intercostal, and great sympathetic nerves, generally arise from debilitated and spasmodic states of the muscles; an opinion which may be confirmed from their sudden cessation on taking a dose of opium, or perhaps, merely a warm stimulant. But the frequent returns of these paroxisms has a tendency to dry up the serosity which moistens the fibres, and even to condense the subs ance of the muscle itself, so that the disease forms an established habit of always returning to the same places it before occupied, and acquires a considerable degree of aggravation, from the encreasing rigidity, and declining strength of subsequent years.

Inflammatory Gout attacks later in the period of manhood than acute rheumatism. In a peculiarly predisposed habit, which is most commonly derived from the parents, symptoms of dyspepsia take place for a day or two, and are immediately followed by an inflammation of the joint of the great toe, on which the weight of the body moves: it is observable that, after certain intervals, more acute and extensive inflammations take place, and the disease receives additional force by every recurrence of its paroxysms. In no great length of time the joints of the superior, as well as of the inferior extremities, become affected, from communication of the plantar with the grand sympathetic nerves. The gouty temperament having a tendency to form chalky concretions, after the inflammations have subsided, less phosphate of lime is found in the urine at that period, than in the other stages of the disease; and by the deposition of this calcareous substance into the joints, together with the desiccation of synovia, and the increase of muscular debility, by repeated attacks of the disease, the limbs are rendered immoveable after the paroxysms cease. They may, however, be preserved in a tolerably serviceable state, through a great length of life, by a perseverance in the use of local and general exercise. But when

the inflammatory paroxysms are transferred from the joints to the stomach, chest, or brain, the disease, for the most part, tends to a rapid dissolution of the whole frame.

In the SECOND EPOCH of manhood, the cavity of the abdomen becomes the seat of numerous organic diseases. Not only the glandular viscera, but likewise the fleshy parts of the membranous ones, are disposed to become schirrous, more than at former periods of life, when their natural structure was less firm and indurated.

The glandular system, which proved a principal source of mortality in the lax and growing state of the infant body, becomes again the seat of peculiar diseases, in the decline of life, when its functions are less required. Tumors of the belly, named *Physconiæ*, invade the body at all times between thirty and sixty years of age; they, however, appear most frequently in the last epoch of manhood, which the author has frequent opportunities of observing, among the great numbers of these diseases annually imported into Cheltenham. The general induration of the glandular system, and the decline of the vital powers, in some measure explain the nature of the predisposition towards these obscure inflammations, after the meridian of life. But the slow progress

of such diseases must likewise be considered as a cause of their most predominant appearance, in ages far advanced, since they often run a course of many years without proving fatal.

Diagnosis has always been considered as the most intricate part of medical science, and this opinion becomes more evident with respect to abdominal diseases than with any others which invade the body. The large glands of the belly, from a natural insensibility of structure, are attended with so little pain, in proportion to the extent of the injury they sustain, that their tumors are generally far advanced before their existence is discovered: and the various hepatic and alimentary organs uniting their powers, in subservience to the grand purposes of digestion, the failure of their functions, and the general appearances of the body, are very often the only indications of the many dangerous diseases found in the cavity of the belly after death. But a general derangement of structure also increases the difficulty of distinguishing between them. Morbid actions are readily communicated from one viscus of the abdomen to the other, in consequence of a peculiar community of vessels and nerves; and the diseased organs are also liable to affect the sound ones by pressure, so that a general state of dis-

organization very frequently obscures the observation of the original disease.

The liver, the largest organ of the body, is found more frequently diseased than all the other glands of the abdomen together, which may readily be understood from the peculiar character of its organization. When the irritability of the system diminishes, and the circulation of blood slackens in the period of manhood, the liver becomes particularly predisposed to diseases, and the exciting causes are also more numerous than at other ages. The application of intense heat to the surface of the body, particularly in its relaxed state, under a vertical sun—the free use of stimulating diet and drinks—and violent passions of mind, have great power in debilitating the structure of the liver, so as frequently to bring it into a state of *Paralysis,* and produce a torpid action of its vessels. As the liver possesses merely the muscular fibres of its own vessels, and only few nerves in relation to its immense size, which are supplied chiefly from the great sympathetics, its diseases generally attended with little pain, are extremely obscure, and often connected with other affections of the system. So great is its influence over the sympathies of the rest of the system, and so necessary is its biliary secretion to the healthy condi-

tion of the assimilating powers, that Boerhaave considered the liver as the chief seat of all the chronic disorders of the body.

Many of its diseases resemble those of the female breast, except that being an internal organ, it is not like the breast subject to cancer; but it is extremely liable to *Congestions of Fluids.* The different proportions of blood that this vascular mass is liable to receive at different times, and chiefly by a slow venous circulation of debilitated blood, returning from the other abdominal viscera, subject it to frequent sanguineous congestions, which readily take place from free living—intermittent fevers—transferred gout—and suppressed evacuations—without being attended with inflammation, or immediate danger. The same may be said of the lymphatic and biliary congestions, which often take place in its parenchymatous substance, as well as in its excretory channels. It is subject to *Acute Inflammations* of its membranes and arterial system, which are sometimes as severe as those of pleurisy, and at other times to *Chronic Inflammations* of a very obscure nature, which have a strong tendency to terminate in *Abscesses.* But its indurations are by much its most frequent diseases.

Schirrus of the Liver commonly commences

by partial thickenings of the structure of the organ, which gradually extend themselves to the rest of its substance, but at first are attended with little fever, and a slow advance to suppuration. When, however, a large portion of the organ becomes scirrhous, a sense of weight or pain is felt in the right side of the body, upon which the patient can often lie with greater ease than on the left side, and are accompanied with some degree of fever, yellow eyes, and a peculiar sympathetic action, that communicates from the liver to the posterior and superior parts of the right shoulder, owing to the communication of the phrenic with the cervical nerves. Although these are considered as characteristic signs, it sometimes happens that few or none of them take place, and the disease exists with the appearances only of sallow complexion, and general ill health. The obstruction the blood meets with in passing the indurated or inflamed liver, proves a frequent cause of bleedings from the nose, or of sanguineous discharges from the hœmorrhoidal vessels, and these are always to be considered as salutary efforts of nature to remove the disease; but when the induration acts as a ligature upon the abdominal circulation, there most commonly arise dropsical or jaundiced states of the body, likely to prove fatal to the life of the patient.

Ascites may proceed from an indurated state of any of the glands in the latter stages of life, but it is more commonly induced by diseases of the liver than by all other causes together. Morgagni says, he never opened a patient for ascites in whom he did not find a diseased liver. The indurating cause obstructing the circulation, and pressing either on the blood vessels, or thoracic duct, produces an exhalation of fluids into the abdomen, after the manner of the anasarcous swellings, which takes place on the legs of females, from the pressure of the gravid uterus on the iliac vessels, with this difference, that in one case the pressure of the liver continues until the functions of life are completely destroyed by serous fluid, whereas in the other the diseased symptoms disappear with their cause.

Obstructions of the Gall Ducts are not only the most frequent but the most distressing affections of the hepatic system, and at the same time are seldom attended with danger. The predisposition to generate biliary concretions is greatest in the advanced part of manhood, when the circulation is diminished, and they seldom occasion diseases in childhood, or youth, nor do they occur so frequently in warm as in cold climates. The ducts become obstructed, either by indurated bile, or by stony crystalizations, which

probably receive their nucleus from the liver. After they have enlarged their size in the gall-bladder, they find their way into the common duct, and pass by repeated paroxysms of excruciating pain into the intestines, or they become impacted in the ducts, when the consequent absorption of bile into the blood produces *Jaundice,* which makes its appearance with yellowness of the eyes—red-coloured urine—clay-coloured fœces—and an obstinate costiveness, from deficiency of bile in the intestines, and very often with itchings of the skin of the most inveterate kinds.

It appears from the frequent occurrence of *Scirrhous Spleen,* that a great similarity of diseases takes place in all the glandular viscera of the abdomen. It is not surprising that the use of this viscus has puzzled anatomists, since it differs from all other glands, in having no excretory duct. The spongy organ suffers some change of form, from the empty and distended states of the stomach; and some instances have occurred of diseased persons having no spleen*, while many others possessed a plurality of small spleens, or a spleen divided into a number of lobes, without any difference having occurred

* Leiutaud, Tom. 1. lib. 1. p. 234. from Zacutus.

in the living functions. Even the different morbid conditions of the organ are attended with less danger than those of other internal viscera, notwithstanding the number of large blood vessels composing its structure. Its scirrhosities are not so fatal as those of the liver, and *Tumefactions of the spleen*, are its most frequent diseases, and seldom of a dangerous nature, since it becomes at times turgid with blood to thrice its usual magnitude in lingering intermittents, and yields to evacuating remedies, or subsides spontaneously, leaving no remarkable alterations in the organization*. This disease is extremely common among the natives of India, who cure it with tonics internally, and with the actual cautery externally applied.

Scirrhus of the Pancreas is not of uncommon occurrence, but the deep situation of the organ behind the stomach, conceals the knowledge of its diseases. The principal diagnosis of the scirrhous state is, therefore, taken from

* The immortal Lord Nelson, while under the author's care, thirty years ago, had a tumefaction of the liver and spleen, in Jamaica, arising from intermittent fever, which rendered his belly as prominent as that of a person in the last stage of ascites, and they both spontaneously disappeared in less than a year after he arrived in Europe.

the derangement of the digestive and intestinal functions, chiefly in consequence of its pressure. *Pancreatic Concretions* formed from the salivary fluid of the organ, are its most common disease; since they often pass by the intestinal canal, and are mistaken for biliary calculi, without any previous knowledge of their existence. The effects of mercury on this gland, so remarkable at the time of its operation on the salivary glands of the mouth, afford a powerful argument in favour of the use of that grand specific, in all other glandular diseases.

The fleshy parts of the membranous viscera are predisposed to scirrhus in this epoch, as well as the large glands. Thus, scirrhosities of the *Œsophagus*, and of the two orifices of the stomach, are common appearances of this kind. The membranes lining their internal surface become so inflamed and thickened, as greatly to contract their orifices. When it happens to be *Scirrhus of the Cardia*, the food is returned almost immediately after it is taken in, without any admixture of bile; but when it is *Scirrhus of the Pylorus*, the food is retained a considerable time, and vomited half digested. In these three instances, the alvine evacuations become deficient, and the patient is starved to death in no great length of time. One patient, however, belonging

to the Finsbury Dispensary, a dram drinker, lived nine months, and vomited almost the whole time every species of nutriment a few minutes after it was taken in. He died completely emaciated, and the stomach was found on dissection extremely small, with the cardiac orifice in such a contracted state, that the opening was scarcely so large as to admit a goose quill.

The intestinal canal is likewise subject to scirrhous contractions at this age. Thus *Scirrhus of the Rectum* is more frequent than thickenings of any other part of the canal, which are of a less fleshy nature. That organ is, in fact, particularly subject to *Ulcerations,* thickenings, and contractions from the remora of its contents in a state of acrimony, and their pressure upon its blood vessels; causes which operate oftener in the advanced stages of life than at any other ages. The disease is at first attended only with symptoms of flatulency and costiveness; but when the parts become more cartilaginous and contracted, it disorders the stomach, occasions frequent ichorous dejections, and at length ulcerates the parts, and sometimes renders them cancerous. The muscular structure at the *Valve of the Colon* is likewise a common seat of the most lingering scirrhosities, after the meridian of life, which terminate fatally.

The venous plethora, which prevails in this

epoch, occasions a greater tendency to congestions in blood vessels, which have few valves and a slow circulation, than in others; such as in those of the brain, liver, and hœmorrhoidal vessels. Hence arises a greater disposition to *Piles* between thirty-five and sixty years of age, than in any other period of life. The vessels of the rectum either pour forth blood freely at stated intervals, thus affording a salutary evacuation in many cases of gout and diseased liver, or they form painful tumors gorged with blood, which project beyond the verge of the anus, and become extremely painful, more especially when costiveness, sedentary habits, or pregnancy co-operate in retarding the return of blood from the gut.

The important changes taking place in the female constitution between the fortieth and fiftieth year of life, become first apparent by the longer intervals and greater discharges of the natural flux for a year or two, until it ceases altogether about the forty-eighth year. There arises then, a tendency in the habit to form substitutional evacuations, and therefore *Leucorrhea, Ulcers of the Legs*, and *Hœmorrhagies* from the nose, or from the hœmorrhoidal vessels, not unfrequently take place as salutary affections of the body. But when the hœmorrhagy from the uterus returns, after having ceased several years, or very late in

the period, there is frequently reason to apprehend the existence of a morbid state of the womb.

Scirrhus of the Uterus is a disease frequently occurring between forty and sixty years of age, while the natural changes of the uterine organs are taking place. Hardness commences at the cervix of the womb, its most cartilaginous part, extending gradually to its muscular body, and terminating in a rugged cancer of the most tormenting nature.

Scirrhus of the Ovaries and Tubes are also frequent occurrences at this age; but the most common disease of these parts is *Encysted Dropsy*. Cysts of water are formed in the ovaries, which encrease in their number and magnitude until they fill the whole abdomen with fluid, which destroys the neighbouring parts, occasions swelled legs, and most commonly terminates in death.

Nothing can be more evident than the fact that the mind changes its state with the evolutions of the body. We not only observe the sanguine imagination of youth succeeded by the sound judgment of maturer years, but we also discover it to be a universal law of nature for the animal spirits to diminish with the increase of years, and for men to become more serious as they grow

old. This, in a physical view, may be considered as depending upon the gradual increase of density in the cerebral organ and nerves, which give firmness to the mind as well as to the body. But the variety of habits in middle age, give a direction to the operations of the mind, which often excites in it a great degree of morbid sensibility to the natural occurrences of life. The cares and anxieties of some men, in providing not merely for themselves, but also for large families, often induce a distracted state of mind; while others living in states of affluence and idleness, are troubled with a species of diseased sensibility, equally distressing.

The numerous exciting causes of the period, such as intemperate modes of life,—violent passions,—excessive mental exertions,—and repeated disappointments, become extremely liable to produce mental diseases in this active period, which were unknown in former stages of life. One change, however, arising in adult age, has a tendency to diminish the irritability of mind which naturally increases with years. Corpulent persons are less subject to nervous diseases than lean ones, owing either to the fat defending the sentient extremities of the nerves from impression, or to its interrupting their free communication with the brain.

The *Hypochondriac Disease* rarely occurs before the period of manhood, and is extremely liable to be aggravated by the melancholic temperament of old age. This unhappy state of mind, which has derived its name from diseased hypochondriac viscera, has its seat in the epigastric region, for a morbid state of the stomach and digestive powers are the usual precursors of the diseased perceptions of mind. In consequence of luxury,—idleness,—and satiety, we find hypochondria taking place among the higher ranks of society ten times oftener than it does in rustic life. It has also been observed by authors, that men of letters have generally weak stomachs, and become dull,—irritable,—and watchful, from habits of great study. Rousseau was so impressed with the evil effects of excessive mental exertion, that he praised the customs of the inhabitants of the banks of the river Oroonoko, who made their children wear boards on their foreheads, because it prevented genius by an early compression of the brain.

The *Melancholic Disease*, more of a mental character than the former, occurs for the most part in the second epoch of manhood; but when it is hereditary, we can sometimes discover a tendency to its appearance before thirty years of age. It is a disease liable to be confounded with hy-

pochondria, on account of the dyspeptic symptoms which sometimes attend both; but the false perceptions of mind, and the dejection of the melancholic patient, are indications of a distempered brain, which respect other circumstances than health, whereas in the hypochondriac the mind is entirely turned inwards upon the bodily affections.

Insanity is evidently a disease of advanced years, if we take into account the rapid decrease of individuals after the meridian of life; and it is less easily cured the older men grow. It seldom occurs before twenty, its attacks are numerous between twenty and forty, and it prevails most between forty and sixty, in proportion to the numbers living at that age. But at no time of life are the subjects of this most afflicting of all diseases, remarkable for long life. It commonly appears in England as an hereditary disease among the higher ranks, who seldom change their temperament by intermarriage with the rustic orders of society, and its occurrence among the inferior orders, depends chiefly upon their habits of drunkenness, or on their imprudent use of mercury.

The most common appearances on dissecting the brain of maniacs, are, inflammations, indurations, congestions, hydatids, concretions, and collections of serum; but as these are as likely to be

the consequences as the causes of the disease, and as different opinions have existed on the state of brain predisposing to mania, it may not be inexpedient to observe, that of thirty-seven dissections made at Bethlehem Hospital, the structure of the brain was in eleven cases firmer than usual; in six it was softer; and in the remaining twenty its consistence was natural *. Morgagni however observes, that in all the insane persons he dissected there was a considerable hardness of brain *.

Suicide is not an uncommon consequence of these mental diseases, both in and out of madhouses, in the period of manhood. The shocking practice has so much increased of late years in this country, that we have reason to believe it acquires force from example. Neither savages nor inferior animals wilfully kill themselves, which is a proof that the exalted state of nervous sensibility of the human species, rendered morbid by the habits of civilized life, induces the insane states of mind which determine men to destroy themselves in violation of the feelings of nature, and in opposition to all laws human and divine.

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* Haslam on Madness, 2d edit. 1809.

† Morgagni, Ep. viii. § 3.

CHAP. V.

DISEASES TO WHICH THE BODY IS PREDISPOSED IN OLD AGE.

OLD age, like infancy, is subject to an infinite number of diseases, from imperfections of organization. The different organs, which in early life were liable to receive injury from a fluid and weak state of their structure, are now predisposed to morbid action from universal rigidity. So numerous are its infirmities and diseases, that Galen called the whole period of old age a distemper, we therefore can only select those diseases which prevail most generally, as the subjects of present consideration.

The most common occurrences of the FIRST EPOCH, are dyspepsia, muscular rheumatism, urinary and pulmonary diseases.

Dyspepsia is the most common of all diseases which distress old people, and it has connection

with the hypochondriac state of mind so prevalent at this time. It is perfectly obvious that the irritability and strength of fibre decaying in the elementary organs, as in every other part of the system, predisposes the body to diseases. Old people can neither digest their food, nor sustain the long intervals of abstinence they did in younger years. They have in general good appetites, and are apt to indulge in full meals, at the time their exercise has diminished, and their mastication becomes defective. It is however nature's law to remove their teeth, when the waste of the system requires a smaller proportion of food, we therefore often find them in the habits of too full living, which proves a common exciting cause of dyspepsia, and of the symptoms of flatulency and costiveness that prevail so generally in the period. In the melancholic age full diet is also liable to excite the hypochondriac disease, and still more destructively, to fill the vessels of the head with blood, when the tendency to venous plethora prevails, in old persons.

Erratic Pains of the muscles is a prevailing disease in many aged persons. The rheumatic spasms of the trunk of the body, sometimes transmitted from former periods, or the cramps which arise in the lower limbs, emphatically described by the aged as pains in the bones, are disposed to

receive aggravation from the muscular rigidity and debility of the period. The author has at times seen wandering pains and spasms of the muscles more of an hypochondriac than rheumatic nature, and has also heard old persons complain grievously, how much they suffered from wind flying about them, which arose from their receiving relief from muscular pains, by discharge of flatus from their stomach and intestines.

Prurigo Senilis sometimes takes place in old people, so violently as to make them draw blood by scratching themselves. These itchings of the skin are in general more difficult to remove than the common contagious itch, although they are seldom attended with any cuticular eruption. It is therefore evident, that the diminished tension and unperspirable state of the cutaneous surface, which are peculiar to advanced years, must have a principal share in disposing to the disease.

The early failure of the urinary organs, favoured by the circumstances of the melancholic temperament,—the earthy state of the fluids,—and the gouty diathesis of the period,—dispose aged people, particularly of the male sex, to numerous painful diseases, which would render life

insupportable if they did not make their appearance in a slow and gradual manner.

Gravelly Diseases frequently commence with the appearances of uric acid in the urine, after it has cooled, but that salt is seldom productive of pain in passing from the kidneys, even when it is so abundant, as to appear in copious crystals like *red sand*. If however it unites with other matters in the uriniferous tubes of the kidneys, it forms gravelly concretions in the pelvis of those glands, and occasions acute pain on passing the ureters. As soon as the distending body has escaped into the urinary bladder, the pain suddenly remits, and the patient is said to have had a *Fit of Gravel*, or stone. But when the small concretions do not pass into the ureters, and continue impacted in the unriniferous tubes, they are liable to produce inflammations, abscesses, and other *Nephritic Symptoms*, which are frequently so severe as to excavate the substance of the kidneys.

If these concretions do not soon afterwards pass from the bladder, or when new ones are generated upon some nucleus in that cavity, the different deposits of uric acid and calcareous matters from the secretion, form regular layers of new crystals, and become large *Urinary Calculi*, which produce a degree of pain proportioned to

their size, ruggedness, and detached situation in the bladder *. But these not being equally disposed to form concretions at all ages, nor with every kind of diet, there arises a great difference in the species of the stones, and in the time of their appearance. They are all, however, composed of earthy particles, crystalized with animal mucus, and these substances are without doubt most abundant in old age, which is the time in which the disease most commonly appears. Thus, the bony fabric so fully indurated in old people as to receive no more phosphate of lime, but on the contrary manifesting a dispo-

* The largest stone that has been found in this country, in the human bladder, is described in the Philosophical Transactions for the year 1808, and is deposited in the museum of the Royal College of Surgeons. It weighed three pounds four ounces, and nearly filled the whole bladder. Sir Walter Ogilvie, from whom it was taken, died ten days after the operation of lithotomy, in his fifty-third year. It was supposed to be formed in consequence of a blow received on his back thirty years before, which paralized the lower extremities.

It cannot be too often made known, that when neither alkalies nor other remedies before tried, can dissolve stones in the bladder, late experiments show, that their formation may be prevented by twenty grains of magnesia, taken two or three times a day, for a few weeks or months together.

sition to part with it, the calcareous matter must either go off with the urine, or become liable to form ossifications on the coats of the arteries, gouty concretions in the joints, or stones in the urinary bladder: hence the species of stone most commonly found in the bladder of old people, according to Dr. Woollaston, is chiefly composed of phosphate of lime with animal mucus, and exhibits a pale brown surface.

The neck of the bladder, from its fleshy structure and dependent situation, is more subject to diseases than the other parts of that sac. *Incontinence of Urine* is therefore a common consequence of paralysis, or of the increase of the natural debility of the sphincter muscle, in old age, and is liable to diminish the cavity of the bladder by its long continuance. But a still more distressing disease, a *Retention of Urine*, is liable to occur, from the various organical affections of the urinary passages, to which the age is obnoxious; and it very often dilates its cavity, and destroys the muscular power of the bladder.

The most common of these obstructing causes, is the *Enlargement of the Prostate Gland*, which, from the beginning of its occurrence, may be considered as natural to the period. But the swelling of its posterior lobe not unfrequently occasions dangerous obstructions of urine, and painful

stranguries in old people. This gland being naturally one of the firmest glands of the body, it also becomes subject to *Scirrhous Induration*, and to a contraction of its substance in the evening of life.

The pulmonary system is more subject to diseases than any other part of the body, in the period of old age. When the cutaneous vessels have contracted, and the surface of the body has become less perspirable, a greater afflux of fluids to the lungs naturally takes place, and of course the exhalations from the arteries terminating in the bronchial cells increase, as does also the secretion from the mucous glands, situated in the subdivisions of the trachea.

Winter Cough, the principal endemic of Britain, naturally arises from trivial causes in the cold season of the year, in consequence of the accumulation of fluids in the debilitated lungs of old people. It is usually accompanied with a copious expectoration of a viscid, yellow, or greyish phlegm, secreted from the glands of the lungs, which is known by its seldom uniting with water. But in consequence of the agitation of coughing, blood is also liable to escape from the extremities of the exhalent arteries, without rupture of vessels or other dangerous symptom, and the disease disappears spontaneously in the

following summer, when the perspiration becomes freer. In this way it may continue to return every winter for a great number of years.

Catarrhs and defluxions of serum, are still more apt to make their appearance in the eyes and nose of old people, than they were in the weak state of the muscous membrane in infants. The *Catarrhus Senilis* is, therefore, not only a frequent appearance from habits of free secretion acquired in former periods, but it also arises from severe colds inducing inflammations of the superior parts of the pituitary membrane, which extend themselves to the lungs, gorged with fluids, and prove destructive in this feeble period.

Asthma is extremely common in the debility of old age, both as a permanent and a spasmodic disease. The tendency to difficult respiration must naturally increase as the transmission of blood becomes impeded, by the augmenting rigidity in the rings of the branches of the trachea, as well as by a contraction of the pulmonary cells, and by the turgescence of fluids, incident to the lungs of old people.

Peripnumonia Notha is the most common of all the inflammations of the lungs, particularly among the poor in winter, after their fiftieth year. It becomes epidemical in humid states of that season, which destroy the healthy elasticity

of the atmosphere, and augment its coldness. There arises an inflammatory state of the system, and fever, accompanied with pain of the chest, difficult respiration, cough and copious discharges from the lungs, of matter which is known to be puriform by its ready union with water, and the mode of its subsiding on standing. In many of these cases, the repletion of blood in the lungs interrupts the free action of the heart, and terminates in suffocation. Physicians of hospitals in London are constant witnesses of the tendency of these diseases to recur annually among the poor, in the cold season, and to increase their virulence every time they renew their attacks. Every exudation of fluids into the cells of the lungs, must either be spit up, or their cells gradually glewing together, will at length suspend the functions of the organ.

The arteries of the lungs of elderly persons are sometimes found *Ossified*, although by no means so frequently as the arteries on the left side of the heart. In the late Mr. Tiberius Cavallo, of the Royal Society, many of the small branches, and some of the trunks of the pulmonary artery, were one continued case of bone. He was of a spare thin habit, had long laboured under great difficulty of respiration, severe cough, and copious purulent expectoration, and died apparently from the ef-

fects of ossification of the lungs, in 1809, at only sixty-five years of age*. But the *chalky concretions*, which are sometimes spit up from the lungs of old arthritic patients, proceed from the bronchial cells, and are completely different from the ossification of arteries.

Dropsies are frequent terminations of the diseases of the lungs. The greatest number of anasarcas observed by the author among the poor of the metropolis, proceeded from diseases of the pulmonary organ. The difficulty the blood meets with, in returning to the left side of the heart, causes the exhalents to pour forth more serum than the absorbents can take up, and of course accumulates first in the dependent part of the extremities, where the circulation is most languid, and extends gradually upwards, until it reaches the cavity of the belly.

The SECOND EPOCH of old age, decrepitude, is particularly subject to organical diseases of the heart and brain, and to destruction of the soft solids in remote parts of the body, although they are by no means confined to the period. The organic affections of the vital organs have been discovered only within the last three hundred years,

* Dr. George Pearson obligingly shewed the author a very complete preparation he had made from these lungs.

by opening morbid bodies, and they are still so imperfectly understood, that we know not the precise time they begin to assume the nature of diseases, nor the symptoms by which we can distinguish the one from the other, in the living body.

We found that several malformations of the heart occur in the uterine state, from errors of growth, while that organ was relatively large, succulent, and irritable; and that they seldom afterwards appeared in the firmer periods of infancy, youth, or early manhood; but when the heart becomes rigid, and the principles of life suffer by decay, mechanical powers begin to predominate over the vital ones, and the heart becomes again subject to diseases of the most alarming kinds, which prevail more and more as men approach the natural limits of mortal existence.

We cannot, however, consider all the appearances of an old heart, which differ from those we observe in middle age, to constitute disease, since we often find them prevailing for twenty or thirty years, without disturbing the functions of that active organ; and persons so affected, not uncommonly die of diseases clearly ascertained to have arisen from other causes. By attending to the different dissections of persons of the greatest ages, or even to those cited in the sixth chapter of the first essay of this volume, who died from general decay, we almost always find some or-

ganic affections about the heart. Thus small ossific spots on some part of its surface—bony scales situated within its ventricles—and ossifications of its coronary arteries—or even of the semilunar valves, are severally found in almost every person above seventy-five years of age, and do not always disturb the functions of the living organ. In like manner patches of fat, are often discovered on the surface of the heart, which can scarcely be considered as producing disease at this age, more than any other, unless when they are so abundant as to increase the weight of the organ very much. Sometimes the heart itself is found enlarged, with a considerable change in the thickness of its parietes, the pulse continuing nearly in the usual state. At other times the heart is found of a flaccid or slender structure, without having indicated any particular symptoms of disease during life. The same kind of appearances are found in the aorta, especially towards its arch, which induced Dr. William Hunter to observe, that it was more exposed to danger than any other part of the vascular system, in consequence of the direct force of the heart constantly operating against it, and that, therefore, nature propt it up in the debility of old age, by a thickening and slow ossification of its coats.

These different appearances can only be considered as predisposing causes of diseases, to which the constitution gradually accommodates itself, and within certain limits seldom produce morbid symptoms. But when exciting causes co-operate, and the functions of the heart become disturbed, or the circulation impeded, they cannot exist any great length of time without inducing symptoms of the most distressing and fatal kinds. Thus, intermissions of the pulse —palpitations of the heart—permanent dyspneas—states of syncope—sometimes dry cough —and many symptoms resembling asthma, hydrothorax, and augina pectoris, are common to all the diseases of the heart, when they arrive at any great height.

The heart, from unremitting action through a long life, is more subject to earthy rigidity than the other internal organs, and thereby becomes liable to mechanical injury from *Ossifications*, which are neither regular in their appearance, nor limited in their extent. Chalky matter of a soft consistence, is deposited into the cellular membrane, next the inner coat of the large arteries, and gradually accumulates from within to the exterior, until it destroys their muscular coat, and resists the propelling power of the heart; but greater dangers arises from ossi-

fications, rendering the semilunar valves of the aorta rigid and immoveable, so as to obstruct the circulation of the blood, and increase the exertions of the vital organ. The unsuccessful efforts of the heart to discharge its whole blood at every systole, prove the most common cause of the distressing palpitations, and many of the irregularities of pulse, occurring in old persons.

Dilatations of the vital Organs are occurrences not uncommon at this age, from the tendency of ossified vessels to impede the functions of the heart, and to increase the weakness of its structure. Thus, the distended parietes are at times found thin and flaccid, in consequence of absorption, and at other times softened or thickened from a specific action of the capillary vessels. Both these aneurismal states are productive of injury to the neighbouring organs, and when the patient possesses strength sufficient to struggle through a tedious disease, they terminate suddenly by *Rupture,* and the escape of blood into the pericardium. The heart, weighing in its natural state about four or five ounces, is found in some of these cases enlarged to as many pounds. The most usual dilatation is in the left ventricle, in consequence of the resistance the blood meets with from an ossified aorta. It is likewise occasioned frequently in the right auricle, by ossified valves of

the pulmonary artery, and obstructions of blood in the lungs.

But no part of the body exhibits such frequent dilatations as the arch of the aorta. Ossifications of that artery are generally found, on dissection, accompanied with some degree of enlargement, and accumulation of blood, in its curvature.

A Collection of Water in the Pericardium, is not an uncommon sequel of the debilities, and organic affections of the vital parts in advanced years. The liquor of the pericardium, of which, in the natural state, scarcely a sufficiency is secreted to lubricate the surface of the aged heart, is sometimes effused into that sac to the quantity of a pint, forming a species of dropsy scarcely distinguishable by its symptoms from hydrothorax. In fact, there are no accurate diagnostic signs of any of the diseases of the vital organs, since palpitations of the heart—intermissions of the pulse—dyspnœa—dry cough—oppression of the præcordia—and syncope—severally occur in the different species of vital diseases.

So rapid is the failure of vital power in this epoch, that the remote parts of the body are liable to break out into open cancers and mortifications, without having received any particular injury. Thus, the time of predisposition to cancer in the uterus and breasts of the female having gone by,

the other soft structures of the body, such as the eye, nose, underlip, and face, as well as the large glands, become liable to the attack of *Cancer*, which extends rapidly to circumjacent parts. And so great is the tendency to this tormenting disease, that even warty excrescences are not exempt from cancerous affection in the latter stages of life.

Mortifications are apt to arise in the lower extremities of elderly persons, as being the parts in which the natural failure of heat and circulation is most felt: and there is reason to apprehend, that some of them are connected with the ossifications of the arteries in the feet and toes of old people. The disease, producing insensibility and blackness of the skin, extends rapidly to the more interior parts, and very soon terminates in complete gangrene, while at the same time it is attended with little pain, being devoid of the inflammatory character which usually belongs to diseases of that kind, in earlier periods.

Carbuncle, another species of mortification, which invades the superior parts of the body in old people, is not less insidious and fatal in its nature than the former, but its attacks are by no means confined to old age. A flat boil generally appears on the posterior parts of the trunk of the body, which is immediately succeeded by a dif-

fused ulceration and gangrene of the parts beneath, and terminates fatally in a few days after its first appearance.

Diseases of the brain are, from several predisposing causes, principal sources of the mortality of this late period. When the circulation in the brain and medulla oblongata is diminished, the nerves lose their power and energy, the sensibility and movements of the body become slow, parts fall into a state of marasmus, and lethargy or profound sleep is liable to supervene. Rigidity and ossification of the tortuous arteries, turgescence of blood in the veins without valves, as well as a hydrocephalic state of the cerebral substance, are severally found in persons who die of diseases of the head at this period; and such diseases are nearly as destructive to old people as those of the lungs, and their attendant dropsy *.

Vertigo is not only symptomatic of most diseases, but it occurs likewise as a primary affection in this period. Old people become subject to a sense of whirl in the head, and to occasional staggerings of the body; their sight at the same time failing, the power of balancing themselves,

* In the four years terminating the last century, the number of persons who died within the limits of the bills of mortality of asthmas, were 18,80, and of apoplexy and palsy 12,83. Dr. Heberden's Tables, published 1801.

by external objects is diminished, and they become subject to an opthalmic vertigo. They are likewise troubled with megrims when perceptions are feebly and confusedly transmitted by the auditory nerve to the brain; but as vertigo's take place likewise in the dark and silent night, some change in the cerebral structure itself, and in the plenitude of its vessels, must have a share in the effect; the membranes of the cranium and encephalon, which are destitute of nerves and muscular fibres, can hardly be considered as producing them. We therefore find that vertigo accompanies the blindness and noises of the ears, which precede apoplexies and faintings, and that sudden motions of the head, stoopings of the body, and cerebral exertions, which determine blood to the head, tend to produce vertigo at this age.

Apoplexy terminates the lives of the aged oftener than any other disease of the head. Perhaps not less than a fourth of all persons, who arrive to seventy years of age, perish by apoplexy, or its companion palsy. Dr. Heberden ascertained that apoplexies and palsies annually occurring within the bills of mortality, were doubled in number during the last century, which is a fact well worthy of attention, although some difficulty arises in assigning the cause. It may either proceed from particular modes of living

and the luxurious habits of modern times, or it may arise from the circumstance, that a greater number of persons attain the advanced age in which these diseases prevail, in consequence of an improved knowledge of the means of preserving health.

We have shewn that a particular conformation of body, disposing persons to *Sanguineous* apoplexy in middle age, such as a large head and short neck, favours cerebral plethora, but a general tendency to morbid action in all the parts of the encephalon, occasions its more frequent appearance in this period. Exostoris within the cranium—ossifications of the dura mater, internal carotids, and basilary artery—indurations, ulcers, and tumours of the cerebral substance, are often found on dissection of old people after sudden death; but above all other morbid appearances, none is so frequently seen after apoplexy as accumulations of blood in the cerebral veins, or sanguineous and serous effusions in the ventricles of the brain, in old people.

As three times more blood is circulated in the brain, than in any other organ of the body, a remarkable provision has been made against its obstructions, by the free communication of vessels. It is however perfectly obvious, that the peculiarity of the venous structure of the organ, fa-

vours sanguineous congestions, when the circulation becomes languid, in the latter part of life. We then find the apoplexy of old people often announced by full pulse—pain and heaviness of the head—drowsiness—loss of memory—noises of the ears—imperfections of sight—giddiness on blowing the nose—and by drops of venous blood escaping from the nostrils. Morgagni says, that of twenty-three subjects he dissected for sanguineous apoplexy, three only were youths—four were of middle age—and all the rest were old persons *; a proportion that cannot surprise us, when we consider how often the vessels of the head are surcharged with blood, from habits of full diet and diminished exercise, in the predisposed state of the old brain, and more especially when the blood returning from the head, is interrupted by diseases of the aged lungs.

Serous apoplexy in consequence of effusions from debilitated vessels, does not occur so often as the sanguineous disease, and its symptoms are seldom so distinctly marked as to enable us to discriminate the one species from the other. Congestions of blood, and serous effusions equally compress the origin of the nervous system, and

* Morgagni, Ep. II. A 2.

induce a sudden loss of sense and motion, which is accompanied by a state of profound sleep, and peculiar symptoms of disordered respiration. The disease either proves fatal in a few hours, or terminates in a lingering hemiplegia.

Old persons seldom recover entirely from apoplexy, and the immediate succession of *hemiplegia* terminates the disease in this, more frequently than in the other periods of life. Owing to the divison of the body into halves, by the system of nerves, and to the straight direction of their fibrils in parallel lines, which decussate each other near their origin, loss of sense and motion is occasioned in one side of the body, while the compression or lesions producing it, take place on the opposite side of the brain. The muscles of the eye, lips, and tongue, as well as those of the most distant parts of the body, are rendered paralytic on one side only; and the aged recover so slowly from this state, that the wry mouth, and faultering speech, or perhaps the palsied arm, have advanced little in their progress towards recovery, before a second or third soporific attack closes the scene of deplorable existence.

When the body has journied through a long life, and approaches the appointed time of its dissolution, the failure of power in the large nerves supporting the action of muscles, and in the

cutaneous ones conveying sensations to the brain, bring on different degrees and states of *General Palsy*. But the degree of the privation becomes greater in the nerves of the muscles, than in those of the skin.* It likewise appears that palsies, like apoplexies, depend upon the condition of the structure of the brain, since the nerves of volition and locomotion, which proceed directly from it, suffer more than the branches of the great sympathetics, that supply the digestive and assimilating organs; the latter retaining their functions entire, in most of these diseases, after the failure of the cerebral nerves.

Shakings of the Head and Extremities, now and then occur in aged persons of particular families: but not so often in modern times as when apoplexy and hemiplegia were less common. These, together with slight *Comatose Affections*, wherein the respiration is not troubled, and the senses are easily roused to action, originate in the same state of structure, which has already been pointed out as peculiar to the aged brain.

But the most familiar appearances of this kind, towards the close of a long life, are, *Partial Palsies*, from local debilities in certain muscles that have had great action for a number of years, and are plentifully supplied with vessels and nerves. Thus, relaxation of the upper eyelid, exposing

only half the globe to view—debility of the muscles of the inferior maxilla, permitting the lower lip to become pendulous, and the saliva to flow involuntarily from the mouth—failure of the muscles of the larynx and tongue, occasioning tremulous voice or faultering speech—the loss of power in the sphincter muscles of the cavities, allowing the involuntary escape of alvine and urinary excretions. And as all these failures of the nerves seem to depend upon similar causes, they are extremely prone to terminate in apoplexy.

No other parts of the sensitive system become so much disposed to disease in old age, as the organs of sight and hearing. It is observable, that the sensorium receives erroneous impressions from the different external senses, in their natural state, in a proportion which always corresponds to the multiplicity of parts composing the organ. Thus, the deceptions of optics are very numerous—those of acoustics are not so frequent—while the false impressions of the nose and palate are extremely few—and those of the touch are of still less consideration than any of the others. The same observation applies to their morbid states, for except blunted sensibility, few diseases affect the senses last mentioned, even in this late period of life; whereas they are so multiplied in the eye and ear,

as to require our particular notice in treating of the predispositions of old age.

The eye therefore becomes liable to a great many diseases, from the number of its delicate parts which fail about the same time; and it is attended with a distressing peculiarity, that the diseases of one eye are soon succeeded by similar ones in the other, probably by reason of the medullary fibres of one optic nerve uniting with those of the other, near their origin.

The membranes and coverings of the eye are subject to various ophthalmies at this age, among which we may chiefly reckon *Epiphora*, a watery state of the eye from overflow of the lachrymal secretion—a *Yellow Humour* of the lids, exuding from the tarsal glands—and *Ectropium*, a gaping state of the eyelids, exposing the lower part of the globe to view. But these states are in general attended with so little pain or danger, that they might be considered rather as unseemly inconveniences, than as hurtful diseases, when inflammation is not superinduced, by over exertion of sight, catarrhal affections, or too frequent rubbing of the eyes.

The delicate tunics of the eye, possessing few vessels or nerves, become particularly subject to diseases, when the living powers of the system are on the decline. Thus, the cornea is liable to *Albugo* or films, which obstruct the passage of

the rays of light to the lens, in consequence of the opacity of that part of its coats which covers the pupil; and to *Staphyloma,* which causes a total extinction of sight. In this latter disease, a humor exudes between the layers of the cornea, which terminates in its conical projection, like a sugar loaf, with a speck at its summit. Under this affection no relief can be derived from glasses, which are so efficacious in the myopic convexity of the eye.

Some of the humors have a tendency to desiccation in old age. Thus, the *Cataract* attacks both eyes most generally after sixty. The predisposition to opacity of the crystalline humor, and to thickening of its capsule, becomes so great, that a grey spot commences in the middle of the pupil, without previous inflammation, increases its size, consistence, and yellow colour, until no rays of light can penetrate the inner chamber of the eye, and therefore after a certain length of time total blindness ensues. But it is a comfortable reflection, that this alarming disease can be extracted with safety, in most instances of old age, and the sight be restored when the other parts of the eye are sound, and gutta serena is not complicated with it, as frequently happens.

The expansion of the optic nerve generally loses its sensibility in the evening of life.

Pseudoblepsis, an imaginary vision of black spots, or of objects floating before the eyes of old persons, in consequence of imperfect perceptions by the retina, is a disease unattended with dilatation of the pupil, and seldom terminates in loss of sight. The same may be said of the blindness preceding the attack of apoplexy, which is therefore sometimes cured by bleeding, particularly when it arises from dilatation of the ophthalmic artery in the centre of the optic nerve. But *Amaurosis*, which supervenes upon old age, without apparent defect in the globe, most commonly terminates in total blindness, in consequence of a palsied state of the retina, and the disease is generally discovered by the loss of the contractile power of the iris, from the communication of the ciliary with the optic nerve *.

Although the diseases of the ear bear a strong resemblance to those of the eye, they are not so well understood. The morbid states of the internal organ concealed from view, and unattended with pain, have been little investigated, and the organic obstructions to propagation of sound, have

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* This disease still retains the old name of gutta serena, which the Arabian physicians gave it, under the supposition that it proceeded from a drop of lymph that did not darken the pupil, like opacities of the cornea and crystalline lens.

too often been confounded with the atonic states of the percipient structure.

Dysecœa, in all degrees, from simple dullness of hearing to absolute deafness, occurs in old age from internal causes, more frequently than from affections of the external meatus. The aqueous fluid of the labyrinth becomes defective in some persons, and of a gelatinous consistence in others. The auditory nerve also suffers compression from dilated vessels, and ossifications. But we cannot consider the uniform appearance of deafness in both ears, happening to near a third of the whole number of old people who arrive at extrême old age, to arise from casual circumstances; it must depend upon some change of structure in the brain, peculiar to the period. The eustachian tube renovating the air of the internal ear, and chain of bones conveying vibrations from the drum, by acquiring rigidity in common with other parts of the system, must retard more or less the progress of impulses to the perceptive organ. But the principal seat of the disease in this period, is in the nervous expansion of the portio mollis of the auditory nerve, distributed over the divisions of the labyrinth, which becomes insensible to stimulus, like the retina of the eye, in some persons sooner than in others. Hence we frequently find louder tones, and the stronger im-

pulses of an ear trumpet, necessary to relieve the indistinctness of hearing, which terminates at last in a complete palsy of the delicate organ.

Nothing shews the failure of the internal parts of the ear by age, so much as the *Tumultuous Sounds*, which distress the remaining powers of the perceptive organ. False impressions present themselves to the mind as realities, when no impressions have been made on the external meatus. The various confused noises, which so greatly resemble the rushings of air or water within the ear, the *Tinnitus*, hissings, murmurings, and buzzings, arise from false impressions of the auditory nerve, which are not always imaginary, although they be internally excited *. Thus, the sensations of *Beatings* in the ears sometimes proceed from the pulsations of arteries, either in contiguity with the acoustic nerve, or affecting it through the intervention of the bones of the cranium.

* Neither the Syrigmus of Sauvage's Nosology, class viii. genus 4, nor the Paracusis Imaginaria of Cullen's Nosology, class iv. gen. 97, affords a satisfactory or distinctive character of these various sensations.

ESSAY III.

THE PHYSIOLOGICAL PRINCIPLES OF LONGEVITY,

DEDUCED CHIEFLY FROM TABLES OF MORTALITY, AND THE PRECEDING HISTORY OF THE BODY.

THE many irregularities observable in the duration of human life, variable and uncertain as the winds, occasion great difficulty in distinguishing the laws which govern them; but we are sure that, like every thing else in nature, they are subject to fixed principles, however much their appearances may be modified by local circumstances. To enable us to succeed in the analysis of a subject so greatly diversified as the present, it becomes necessary to consider in a separate

manner, the general mortality of mankind—the extraordinary instances of individual longevity in different countries—and the specific degrees of longevity which attach to each period of life, among the inhabitants of Britain.

CHAP. I.

THE GENERAL MORTALITY OF MANKIND.

PREMATURE death is a law so general among the human species, that a small portion of the whole finish their course by natural decay of organs *. The thread of life is usually cut short by diseases, accidents, and the habits of society.

* Premature destruction, the most obvious principle in the grand scheme of creation, appears to be the means employed by nature, to preserve an equilibrium among the immense numbers and varieties of beings, crowded into definite space.

Men are chiefly destroyed by diseases, particularly in early life, and we cannot help observing, with deep interest, that when adults become too numerous in any one place, their lives are liable to be sacrificed *en masse*, from the want of food—the infection of their own bodies—or the effects of mutual hostilities.

In like manner, *other animals*, less liable to diseases, are devoured either by one another, or by the human species. No animal was created for itself alone, but for the existence

Indeed it appears from the subjoined tables, that in no era of existence, are the probable expectations of life much greater than thirty-six years in the dense population of cities, nor forty-one for

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and happiness of the whole: and the system of perpetual reproduction requiring a proportionate progress of dissolution, the most prolific breeds of animals have the greatest numbers of natural enemies. Large fish universally swallow small ones, and thus augment the proportion of their own numbers.—Grazing animals every day unconsciously destroy myriads of insects in the grass—and the numerous tribes of worms and insects, would multiply beyond the proportion of plants, if they were not devoured by carnivorous birds. But the greatest destroyer of animal life is man, without deserving the imputation of cruelty when he does not torment dependant creatures, or unnecessarily sacrifice their lives to his luxuries. Animals, formed before man, were given to him as lord of the creation, and his digestive organs were prepared to feed upon them; he therefore regulates their numbers by his appetites, and the numbers of his own species. The law of nature which instigates him to destroy beings that annoy him, and to appretiate life by its utility to the community, extends at times to the human individual, for the idle and slothful are troubled with diseases, and the aged by some races of men are neglected, and by others destroyed.

Premature death is still *more* common among *Plants* than animals. By the destruction of grain by quadrupeds and the human species—of fruits by the rapacity of birds, snails, and earwigs—and of their kernels by the larva of insects, there is not left one seed of a thousand to perpetuate the species.

healthy country situations, even in the temperate climate of Britain, which produces as many instances of longevity as any country in the world. It has been uniformly observed, that from the time of the ancient Ægyptians to the present day, the globe is wholly peopled three times every century, while, according to the more precise estimates of some authors, a generation is said to consist of thirty-three and a quarter, to thirty-three and a half years. Those persons therefore, who outlive that number of years, make up for the lives of those who die at earlier ages, and of course have no reason to complain of the brevity of a life, which divides less than thirty-four years among the whole human race.

Plants are destroyed in their tender, sweet, and succulent state, by all kinds of vermin or blights, and when they have acquired vigour sufficient to resist the common enemies of early life, they are swept away by frosts, winds, and winged insects, in whole crops at a time. Nature has therefore provided against this waste by an immense profusion of ova, and by the astonishing reproductive powers peculiar to the vegetable kingdom. Many perennials, the more they are consumed the more they increase, and the humbler tribes of grasses, which clothe the earth for the sustenance of its inhabitants, expand under a hardness of treatment which would destroy more perfect beings.

As modern Europe contains about one hundred and forty-five millions of inhabitants, and three generations are extinguished every century, 528 human beings must die every hour in that smallest quarter of the world, and as it appears from annuity tables, that one person of a hundred does not reach the eighty-sixth year of existence, the abbreviation of life from disease is therefore so general, that only six of the 528 die of natural decay. Hence, in order to obtain any thing like a competent knowledge of the subject of longevity, the many incidental circumstances constantly shortening life, must be taken into consideration as means of enabling us to compare their general effects, with the different states of human structure.

Another inference to be deduced from this condition of premature mortality is, that the prolongation of the lives of a much greater number of individuals from infancy to the extreme of old age, in every different country, than happens in the present system of the world, would in a number of centuries multiply mankind to so great an amount, that no possible increase of the productions of the earth would maintain them, nor after a lapse of ages, could the surface of any country afford space sufficient for the increased number of its inhabitants to live upon. This considera-

tion gives us some idea of the general plan of infinite Wisdom in the preservation of the species. But we must, at the same time, agree in the observation made fifty years ago, by a celebrated geographer, that "although at this time there scarcely exists a thousand millions of inhabitants on the face of the earth, yet three thousand millions might commodiously live upon it at one time*." There are therefore at present no limits affixed to the exertions of individuals, nor to the rulers of states, in promoting the happiness of mankind, by ensuring life to the greatest number of inhabitants that can possibly exist among the respective nations of the earth.

The extensive variety of climate, food, and habit, operating upon different states of human organization, involves the subject of longevity in such obscurity, as to render it difficult to account for the immense dissimilarity every where observable in the duration of men. A few instances of uncommon great ages recorded by portraits, tombstones, and newspapers, where the longevity of the great mass of the people is hid from view, can neither lead to correct conclusions respecting the healthiness of particular situations, nor serve to

* Introduction to Busching's Geography, vol. i. p. 47.

elucidate the laws of human duration. As longevity can only, in a general point of view, be considered as exemption from premature mortality, it becomes necessary to compare the destructive influence of prevailing diseases, together with every other cause which shortens life, among all the classes of the community.

The constant observation of premature death in great cities, and of the superior salubrity of country districts, led Dr. Price to suppose that, "if there was a country where men led natural and virtuous lives, neither pain nor distempers would be known, death would steal on men like a sleep, in consequence of no other cause than a gradual and unavoidable decay *." Sydenham was likewise of opinion, that all our chronic diseases are creatures of our own formation; and it is well known to medical men, that these constitute more than half the catalogue of human maladies. But these opinions must be received with limitation, being true only in part, as we perceive from the history of man in his natural state, and of animals in their wild one †.

* Dr. Price on Annuities, 5th Ed. vol. ii. p. 242.

† Dr. Rush says, that the uncultivated nations of North America are particulaly obnoxious to inflammations, fevers, and dysentery. Medical Enquiries, vol. i. p. 25.

In the times of greatest antiquity, before the constitutions of men were tainted with hereditary debilities, we read in the sacred volume of the diseases of Abimelech, Rachael, Jacob, Job, &c. who led pastoral and agricultural lives, and fed chiefly upon vegetables, fruits, and milk, while water was their common drink. Most persons have known instances of husbandmen of our own times, who with strong, healthy constitutions, living under the favourable circumstances of pure air, refreshing sleep, wholesome diet, and in habits of regular exercise, temperance, and cheerfulness, were notwithstanding subject to the attack of various diseases, and exposed to many causes of premature mortality. We have shewn in another place, that many diseases are uniform actions of the body, which assign different degrees of longevity to every particular age, and that the equilibrium between internal and external powers was disturbed, by the debilities of the first and last stages of our existence, and are thereby charged with nine-tenths of the whole of human mortality. There are besides, many diseases occurring from fortuitous circumstances, even in the most perfect states of the machine, to complete the sum of human mortality. There are, in fact, no conditions of men, who are not in all situations subject to premature

destruction, under the exercise of every prudential measure, from causes which are beyond human controul. Whither can we fly to escape from sudden vicissitudes of climate, or from the afflicting losses of relations, friends, and fortune? We can no more guard against epidemic states of weather, than we can prevent diseases from the original condition of stamina, and natural changes of the body.

But it is equally true, that half our diseases are of our own creation, as we perceive in the enormous mortality of great cities. Few persons who spend their whole life in London, get beyond sixty-three years of age comparatively. The rich are swept away by diseases from impure atmosphere, table luxuries, and hereditary debilities. The numbers continually carried off by apoplexy and palsy, from scrofulous debility, and habits of over repletion, are almost incredible. While the poor of the metropolis have still fewer chances of longevity, from exposure to extremes of weather, and infectious effluvia, as well as from diseases of the lungs and dropsies, induced by habits of intoxication, debauchery, unhealthy trades, and scanty subsistence.

The proportionate rate of mortality among

mankind, has been well ascertained by many accurate observers of the last century, in several states of Europe, where registers of living inhabitants, and of births and deaths, have been kept. Registers of this kind were introduced generally into England in the reign of Queen Elizabeth, in the year 1558, to prove the lineal descent of opulent families, and to enable magistrates to ascertain the state of public health. In like manner, bills of mortality have been kept in regular series, ever since the plague of 1603, in London; and Captain Graunt published an account of them in the year 1666, immediately after the great plague which devastated that metropolis. They soon afterwards came into general use in many other towns, for the various purposes of discovering the increase and decrease of population—the ratio of males and females—the number of inhabitants of all ages—the proportion of men capable of bearing arms—and the salubrity of particular situations. But they now form the basis of a complete science of mathematical calculation, which is employed for almost every transaction respecting property, and the uncertainty of human life. The author thinking they may likewise be rendered useful in ascertaining the laws of human longevity, has selected matter for two tables, from the work of

the celebrated Dr. Price, who has opened a new page in the science of numerical mortality *.

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* Many valuable papers on registers of mortality, and on the subject of annuities, are to be found in the Philosophical Transactions by Halley, Kersseboom, Brackenridge, Haygarth, Price, and Morgan. Their general application, however, is in great measure superseded by the correct observations made in Northampton, and in the kingdom of Sweden, and formed into tables by Dr. Price, fifth edition.— A new work by Mr. Baily has also appeared in the year 1810, containing minute algebraical calculations of the science.

TABLE I.

Expectations of Life at all Ages, for the Metropolis and Country of England, in Years and Fractions.

Ages.	Expectations.		Ages.	Expectations.		Ages.	Expectations.	
	London	North-ampton		London	North-ampton		London	North-ampton
At birth	19.2	25.18	33	22.3	26.72	66	10.1	10.42
1	27.0	32.74	34	21.9	26.20	67	9.8	9.96
2	32.0	37.79	35	21.5	25.68	68	9.4	9.50
3	34.0	39.55	36	21.1	25.16	69	9.1	9.05
4	35.6	40.58	37	20.7	24.64	70	8.8	8.60
5	36.0	40.84	38	20.3	24.12	71	8.4	8.17
6	36.0	41.07	39	19.9	23.60	72	8.1	7.74
7	35.8	41.03	40	19.6	23.08	73	7.8	7.33
8	35.6	40.79	41	19.2	22.56	74	7.5	6.92
9	35.2	40.36	42	18.8	22.04	75	7.2	6.54
10	34.8	39.78	43	18.5	21.54	76	6.8	6.18
11	34.3	39.14	44	18.1	21.03	77	6.4	5.83
12	33.7	38.49	45	17.8	20.52	78	6.0	5.48
13	33.1	37.83	46	17.4	20.02	79	5.5	5.11
14	32.5	37.17	47	17.0	19.51	80	5.0	4.75
15	31.9	36.51	48	16.7	19.00	81		4.41
16	31.3	35.85	49	16.3	18.49	82		4.09
17	30.7	35.20	50	16.0	17.99	83		3.80
18	30.1	34.58	51	15.6	17.50	84		3.58
19	29.5	33.99	52	15.2	17.02	85		3.37
20	28.9	33.43	53	14.9	16.54	86		3.19
21	28.3	32.90	54	14.5	16.06	87		3.01
22	27.7	32.39	55	14.2	15.58	88		2.86
23	27.2	31.88	56	13.8	15.10	89		2.66
24	26.6	31.36	57	13.4	14.63	90		2.41
25	26.1	30.85	58	13.1	14.15	91		2.09
26	25.6	30.33	59	12.7	13.68	92		1.75
27	25.1	29.82	60	12.4	13.21	93		1.37
28	24.6	29.30	61	12.0	12.75	94		1.05
29	24.1	28.79	62	11.6	12.28	95		0.75
30	23.6	28.27	63	11.2	11.81	96		0.50
31	23.1	27.76	64	10.8	11.35			
32	22.7	27.24	65	10.5	10.88			

TABLE II.

Expectations of Male and Female Life for the Kingdom of Sweden.

Ages.	Expectations.		Ages.	Expectations.		Ages.	Expectations.	
	Males.	Females		Males.	Females		Males.	Females
At birth	33.20	35.70	33	28.39	30.28	66	9.30	9.97
1	42.45	44.00	34	27.74	29.66	67	8.84	9.46
2	43.83	46.05	35	27.09	29.03	68	8.40	8.94
3	44.96	47.31	36	26.43	28.26	69	7.99	8.42
4	45.57	48.04	37	25.76	27.50	70	7.60	7.91
5	45.62	48.00	38	25.09	26.74	71	7.22	7.53
6	45.50	47.87	39	24.42	25.97	72	6.87	7.16
7	45.26	47.64	40	23.75	25.21	73	6.53	6.78
8	44.91	47.28	41	23.15	24.68	74	6.22	6.40
9	44.46	46.80	42	22.54	24.75	75	5.89	6.03
10	43.94	46.25	43	21.93	23.62	76	5.56	5.73
11	43.26	45.55	44	21.32	23.10	77	5.25	5.43
12	42.58	44.85	45	20.71	22.57	78	4.92	5.11
13	41.91	44.15	46	20.12	21.91	79	4.59	4.79
14	41.24	43.46	47	19.52	21.24	80	4.27	4.47
15	40.56	42.76	48	18.92	20.58	81	3.96	4.13
16	39.83	42.04	49	18.32	19.92	82	3.69	3.84
17	39.11	41.31	50	17.72	19.26	83	3.45	3.59
18	38.39	40.59	51	17.17	18.64	84	3.30	3.42
19	37.67	39.87	52	16.63	18.01	85	3.16	3.40
20	36.95	39.15	53	16.09	17.39	86	3.04	3.34
21	36.28	38.43	54	15.53	16.77	87	2.88	3.22
22	35.62	37.72	55	14.98	16.15	88	2.64	3.05
23	34.96	37.01	56	14.43	15.53	89	2.34	2.82
24	34.30	36.29	57	13.87	14.92	90	2.02	2.55
25	33.63	35.58	58	13.33	14.31			
26	32.98	34.90	59	12.79	13.69			
27	32.32	34.21	60	12.24	13.08			
28	31.66	33.53	61	11.72	12.56			
29	31.00	32.85	62	11.21	12.04			
30	30.34	32.17	63	10.73	11.52			
31	29.69	31.54	64	10.26	11.01			
32	29.04	30.91	65	9.78	10.49			

By annuity tables, we ascertain the general waste of human life, at every age, among the inhabitants of Europe; and they are calculated from different data.

They are formed from observation of the number of births and deaths, as stated in bills of mortality. The columns for London and Northampton, in the first table of this treatise, have been constructed upon this plan. But the data cannot be perfectly correct in places where the number of inhabitants is not stationary, and where the proportion of births and deaths is very unequal. Thus, the expectations of life for the inhabitants of London, are less to be depended upon than for those of other places. The influx of foreigners and of servants to the seat of the empire, after having passed through the dangerous period of infancy —the numerous emigrations of persons in the meridian of life to other situations—and the constant egress and ingress of aged persons to and from the country, occasion a perpetual fluctuation of its inhabitants, which bids defiance to all attempts at perfect calculation. But it is a demonstrable fact, that they might be rendered tolerably correct, if the registers of baptisms were not confined to the established church, and the whole of the deaths were recorded. There are no less than nineteen extensive parishes, and large vil-

lages, in the skirts of the metropolis, not included in these registers, besides twenty-three burial grounds of different religious sectaries, within the liberties, which are excluded from the bills of mortality.

The first column of the table is calculated from Mr. Simpson's observations on the London bills, for ten successive years, which Dr. Price considered as the most correct hitherto published. The second column of the table is calculated from registers of forty-six years, for the small and healthy town of Northampton, wherein the births and deaths have nearly balanced each other at all times. This table shews the average mortality among the people of England better than any other, and has been considered so accurate, as to have long formed the basis of assurance for the Equitable, and other public societies in London.

Tables are sometimes constructed from actual survey of the living and dying at the same ages. This mode is not liable to be effected by the fluctuation of inhabitants. The second table has been formed in this way, from Mr. Wargentin's* registers of twenty-one years for the whole kingdom of Sweden*; from which it appears, that

M. Wargentin, Memoires Academiques de Stockholm, Paris, 1772.

the expectations of life are higher for that kingdom than for London or Northampton, or indeed for any other place hitherto ascertained, except the district of Vaud in Switzerland*. The same table likewise exhibits the proportionate mortality of males and females with great accuracy.

But the expectations of life are often calculated without either bills of mortality or actual survey, by the hypothesis of De Moivre, which supposes a regular decrease in the probabilities of life from childhood to the age of eighty-six. According to this mode of estimation, if any persons age be subtracted from eighty-six, half the remainder will be the expectation of that person's life. It is a plan that facilitates calculation so much as to become generally useful, without the aid of mathematical science, and has long been employed for estimating the value of both single and joint lives, although it must at the same time be acknowledged to have met with many opponents. The latest writer, however, says, "the hypothesis is of great and extensive use in the doctrine of life annuities †." It would be wholly unexceptionable if mankind decreased

* Muret's Observations, in the Bern Memoirs for 1766.

† Baily on Annuities, chap. ix. p. 314.

every year in arithmetical progression, during the whole extent of life; but this does not happen with its first and last stages. It is, however, interesting to remark, how exactly the results of the rule correspond with the expectations, for all ages between the seventeenth and seventy-first year in the Northampton table, which differ only by fractional parts of a year.

From these tables, which are records of facts, we shall deduce the following observations on general mortality.

I. We learn the great disparity of human duration in town and country, and in different geographical situations. Thus, the greatest expectation of life at six years of age for London, is only thirty-six years, but it is forty-one for Northampton, and forty-five and a half for Sweden; owing chiefly to the differences in the purity and coldness of the atmosphere in these situations; and as it is so considerable even in the same kingdom, tables ought to be constructed from registers of both town and country blended together, in order to afford means of comparing the average mortality of one kingdom with that of another. Since the whole population of the world not being supposed to have any rapid increase, one country only gains what another loses in number of inha-

habitants. This appears to have been the plan of Buffon, who has formed his table of expectations for France, from the registers of M. Dupré St. Maur, uniting twelve country districts with three parishes of Paris *. And from this table it appears, that the expectations of life agree in a remarkable manner with those of the Northampton table, before the 5th year: but the annual expectations after that period, are two years lower in the French than in the English table, and this difference probably arises from the greater heat of climate, which shortens the duration of life.

II. We perceive from these tables, the different ages in which the comparative chances of life are greatest, or least. Thus, the greatest mortality is observable in the first epoch of infancy, in all situations whatever, but in cities and large towns it exceeds that of all the rest of life. It has been stated that half the children born in London, die under the age of two years and three quarters.—In Vienna under two.—In Manchester and Norwich under five.—In Northampton under ten years of age †. And although

* Buffon's Natural History, translated by Parr, vol. iv.
† Phil. Trans. Abr. vol. xiii. p. 496.

half mankind in some healthy places, as in Chester and Sweden, may live to their twentieth or thirtieth year, yet the greatest mortality in these situations, is always under five years of age.

At birth, the entire expectations of life for London, are only nineteen years; whereas, [illegible] are twenty-five after persons have enjoyed half the usual term of existence, it appearing by the table, that the expectations of life at the age of twenty-six, are rather more than twenty-five years. In like manner a child newly born at Northampton, has no chance of longer life than twenty-five years; but after the seventh year of its age, when the dangers of infancy have gone by, the expectations of life for that town, exceed forty-one years; which is the longest period in the table.

At ten years of age, a quarter of life has escaped, since the remaining probabilities are only thirty-nine years and three quarters: and at the twenty-ninth year, the transitory scene is half finished, as twenty-eight years and three quarters are the remaining expectations of the table.

III. We observe in the second table, that females are longer lived than males. Thus, from birth until the eighth year, there are two years and a half greater expectations for females than

for males: but a gradual decrease afterwards takes place, until the forty-second year, with the exception of some irregularities about the time of childbearing. And from the fifty-seventh to the eighty-fourth year, scarcely any excess occurs; because the changes of the female constitution increase the proportion of its mortality after the age of fifty. But towards the greatest extent of human duration, the chances of longevity become again more in favour of women; owing perhaps to a natural softness, which prevails in that sex to the last, or to their less frequent exposure to the excesses, which indurate the bodies of the stronger sex.

In nothing are the laws of nature more wonderful, than in the equality of sexes born in all places; doubtless a circumstance intended for the preservation of human beings in every different situation, with the greatest possible similarity in their ages. Polygamy must therefore be a trespass against the laws of nature, as well as a custom destructive of the prolific powers of the human race.

But the appropriate proportion of sexes is only maintained, by a surplus of male births taking place in every part of the world. This has been calculated by Dr. Price at the rate of twenty males to nineteen females, for Europe, and the estimate

is supported by a registry of fifty years for the lying-in hospital in Brownlow Street, London, where the proportion born was nineteen boys to eighteen girls. It may therefore be surprising to some, that the proportion of adult females should be found exceeding that of males, in almost every situation. It has been calculated for Sweden, at the high rate of eleven women for ten men; and although Dr. Haygarth found there were three times more widows than widowers in Chester, the greater waste of males by war, colonization, and casualties of life, cannot account for the whole amount of the excess, since it is extremely great even at birth, and in the period of infancy, and more common in large towns, than in country districts.

Dr. Clarke discovered, by a registry of twenty-eight years for the lying-in hospital of Dublin, that one half more males than females were found among the still born, and suggested several causes to account for this fact*. Thus, the greater size of the male head increases the danger in laborious parturition, and in towns the contraction of the female pelvis by rickety and scrofulous diseases, augments it still more. Besides, the de-

* Phil. Trans. abr. vol. xvi. p. 122.

fective supply of nutrition from a diseased or delicate state of the mother's constitution, must have the greatest effect upon the larger sized body of the male, as well as the compression of the infant brain, in perpetuating a state of debility after birth. Dr. Price does not appear perfectly decided in opinion, whether the surplus of female children is to be attributed to adventitious or hereditary circumstances, which render the male structure less durable than that of the female; but we incline to ascribe it to contingent circumstances, rather than to any natural law of the male constitution, since it is not so great in one country as in another, nor alike at all times in the same place. Can the female system be more perfect, and more advanced in growth before birth, then that of the male, as we perceive it afterwards to be, towards the age of puberty?

CHAP. II.

THE EXTRAORDINARY LONGEVITY OF PARTICULAR INDIVIDUALS, AND RACES OF MEN.

AS external agents can effect no other operations upon a living body, than those which relate to the state of the fibre, the duration of the human machine must depend upon the goodness of its original stamina, and the nature of the changes produced, by powers in perpetual conflict with it.

I. *Peculiarities of Hereditary Stamina* are, therefore, a principal cause of the differences in the duration of human life. Every person must be sensible of the similarity in the different races of men, the frequent likeness of children to their parents in feature, colour, voice, and corporeal structure, and of the continuance of these resemblances, more or less, until the end of life. Nay, the Author has seen the similitude to progenitors,

which had disappeared during life, become, in many cases, strikingly conspicuous immediately after death. It is likewise well ascertained, that a peculiar state of fabric, communicated from parents to their offspring, produces several kinds of hereditary diseases, even late in life; and we have equal reason to believe, that a similar variety of structure, concealed from our view, is the cause of the unequal durability of human bodies. If the features of the face, and the sound of the voice, afford such distinguishing characteristics of the difference of persons, as to be retained in memory for many years, there can be no difficulty in conceiving, that a correspondent diversity exists in the internal structure of the body.

In support of this reasoning it may be stated, that most of the great ages recorded on monumental stones in the church-yard of Cheltenham, and neighbouring villages of Gloucestershire, have been observed by the author to run in particular families; and the same thing with regard to those in the burial-grounds of South Wales, has been remarked by Mr. Malkin, in his tour through that country. It is only from an innate principle of the animal economy, that we can account for the occasional appearances of great age, among the inhabitants of different countries known to be unfavourable to longevity, and the

many instances of persons living in our own island, above 80 years of age, who have led dissipated and irregular lives. In short, we scarcely meet with an aged person any where who cannot boast of long-lived ancestors, and, therefore, no fact relating to human longevity can be better ascertained, than that of its hereditary appearance, however difficult it may be to assign the cause.*

If, in the way of comparison with the divine mechanism of the living body, we may be allowed to instance ships, the greatest specimens of human art, we find the latter constructed to last a century as well as the human body, although neither usually lasts that time; and, notwithstanding the period of their duration must, in great measure, depend upon the perils and storms they have to encounter, yet their soundness of materials, and firmness of fabrication, are the principal causes of their standard durability. We might, in a similar way, compare the differences of structure in the delicate machinery of the body, to the various perfections in the movements of a watch; but we adduce them with no other view, than as familiar illustrations of the effects of an inherent property, since, between a machine which is inanimate, and a fabric possessing vital powers, and a

principle of renovation within itself, no other analogy, than that which is metaphorical, can be supposed to exist.

It was an opinion of the illustrious Haller, that the human body is of longer duration than that of most other animals, because it is composed of softer materials. "The cellular texture is looser, and the bones, arteries, brain, and nerves, are of a softer nature in an adult man, than in a puppy dog*." We can also discover a difference in the flavour of the flesh of animals, although we are totally unacquainted with its causes, or with the primordial contexture of particles which terminates their lives so variously.

The Brunonian hypothesis, in assigning a certain portion of life to animals at their commencement, which determines the length of their duration, explains neither the gradual increase of vital power, as the body approaches maturity—its renewal after the original stock of excitability has been destroyed by disease—nor the uncertain duration of life in every possible situation—we can never, with any degree of accuracy, reason upon life, from its living principle, which cannot be otherwise known than by the complicated actions

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* Element. Physiol. Halleri, tom. viii. lib. xxx. s. 3.

of matter; and we can trace no other modes by which the body shews that it grows old, than induration and contraction of structure, arising from a superinduced state of the organization.

A renovating power, possessed by living matter, has been assumed as a cause of the different longevities of individual men, and a few solitary instances of old people renewing their teeth, and recovering their sight, some years before death, have been quoted in proof of the existence of this power. In the Philosophical Transactions, a person is stated to have had two new teeth at 75 years of age; and another who had shed his teeth in his 82d year—had a new set quite round—and died in the 100th year of his age*. The Countess of Desmond, in Ireland, is said to have renewed her teeth two or three different times, and she lived to her 145th year†. But it is now generally believed that the germs of every tooth, which makes its appearance in any part of life, existed in the jaws of the fœtus. There are instances in which some teeth have not been shed until late in life; and others, in which the Dentes sapientiæ have not appeared until old age. That animals receive temporary vigour from the renewal of their

* Phil. Trans. ab. vol. 1 and 6.

† Easton's instances of 1712 persons above a century, page 5, A. 1799.

coverings, is no mark of their longevity, for those which live the longest possess the least reproductive power; neither can partial renovations of the human body be considered as implying a power that extends to the vital organs, especially in the debility of old age.

The most remarable instances of hereditary longevity, are found in the history of the Jewish Patriarchs, but why the term of human life should have been so much longer before, than after the deluge, has ever been matter of fruitless inquiry. It is greatly to be regretted, that the Mosaic account of the origin of the world, which alone can be depended upon for consistency, should have been so variously translated, as to have laid the foundation of discordant systems of cosmogony, and early chronology. The estimation, however, of the time before the deluge, by ten generations of patriarchs, as deduced from the sacred volume, has been fully confirmed by the profane histories of the Ægyptians, the Persians, and the Chinese*.

* The following are the ante-diluvian and post-diluvian longevity, according to the Hebrew version of the Bible ,as they are deduced from Genesis, Ch. v. and xi, &c.

Ante-diluvian

To reconcile the great ages of the primitive fathers with those of the present day, some authors have attempted to shorten the Jewish, or solar year to a month, and others to three months, according to the modes of reckoning among some eastern nations. These com-

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Ante-diluvian Ages.

Adam, at the birth of his son	130	lived to	930
Seth	105	———	912
Enos	90	———	905
Cainan	70	———	910
Mahaleel	65	———	895
Jared	162	———	962
Enoch	65	translated	365
Methuselah	187	———	969
Lamech	182	———	777
Noah, at the flood . . .	600		

Æra of the deluge 1656 years.

Post-diluvian Ages.

Shem lived to	600	Abraham lived to	175
Asphaxed . .	438	Ishmael . .	137
Cainan . . .	460	Isaac . . .	180
Salah . . .	433	Jacob . . .	147
Eber	464	Joseph . . .	110
Peleg . . .	239	Levi . . .	137
Reu	239	Moses . . .	120
Serug . . .	230	Joshua . . .	110
Nahor . . .	148	Samuel . . .	98
Tera	205	David . . .	70

putations, however, would make the term of puberty unnatural, and out of all proportion to the whole length of their life. They would also render the period from the creation to the deluge so short, as to invalidate both sacred and profane chronologies. Besides, the term of life reduced only to two or three hundred years, is as difficult to reconcile with the present order of things, as the former great ages. All that we are able to infer from patriarchal history is, that the population and fertility of the earth had so greatly increased before the flood, as to render it necessary for the existence of posterity, that mankind should be destroyed by a deluge, which so changed the face of the earth as to shorten the duration of their lives afterwards, and very probably in the following way:

In the first place, we learn from the sacred page, that the age of man decreased slowly after the flood; probably from the operation of physical causes, changing the state of the living fibre in a gradual manner. Thus, the life of Shem fell short of that of his forefathers three hundred years, from his existing only a single century antecedent to the flood. He, however, lived 500 years upon the ruins of the old world, and longevity continued to decrease slowly from his age, to 175 years, at the call of Abraham,

and to threescore and ten in the days of King David*; since which, the age of man has continued nearly at the same standard for three thousand years.

In the second place we may premise, that it is impossible to explain the contraction of the span of life after the flood, by the change from one species of diet to another, as has been so much insisted upon. The sudden dereliction of vegetable diet, and water-drinking, for flesh and fermented liquors, according to the prerogative of Moses, could not so remarkably change the standard of human duration; since no kind of regimen can make a man live two hundred years in modern times, as appears from the effects of the rigid rules of temperance, and vegetable diet, observed by the Brahmins of India. We are therefore of opinion, that the convulsion which changed the face of nature, gave new properties to the edible productions of the earth, and to the respirable element itself; and that these operated gradually upon the hereditary stamina of the body, until a due balance came to be adjusted, between the powers of the living fibre and external stimulants.

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* Genesis, Chap. xi. ver. 11.

II. *The changes which the human machine perpetually undergoes, from the influence of external causes*, likewise determine the degree of its longevity. Although the inherent character of stamina, communicated from the old to the new being, can never be entirely changed, yet the mutable structure of the body has a perpetual tendency towards perfection or degeneracy, according to the prevailing variation from an appropriate equilibrium, between the vital powers and external causes, and the same with respect to the vegetable kingdom. A gardener considers it necessary, not only to choose his plants from the best stocks, but also to direct his immediate attention to their development, as he finds it greatly in his power to control their habits, by particular modes of culture.

The divine fabricator of the human body has established a certain ratio, between the term of puberty and the other periods of life, which determines the extent of vital duration, since the difference of a very few years in the age of puberty, occasions a material variation in the limits of manhood and old age. We therefore discover, that temperature of climate has a great influence upon the longevity* of different races of

* The relative diversity of longevity in the different species of plants and animals, is to be discovered by the rapi-

men, by retarding or accelerating the progress of their body.

The changes of puberty take place among the nations of the Equatorial regions, about 11 or

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dity of their evolutions. *The Duration of Plants* is so much connected with climate, as to have given rise to their division, into annual, biennial, and perennial. Annuals, the smallest and most numerous tribes, live from three to twelve months—biennials from sixteen months to two years—and perennials from two years to several hundreds. This diversity of size and duration, presents a beautiful resemblance to the longevity of the animal kingdom, since myriads of small insects exist only one summer, while many of the largest and most exalted species in the scale of animals, live above a century.

No law of universal longevity has been so well ascertained, as the relationship between slow growth and long life, in both kingdoms. *Large Trees,* which rear their lofty heads, and expand their leafy surfaces, to drink of the celestial stream, attain the greatest ages of all organic beings; by reason, that they require the longest time to arrive at their complete growth, and at the perfection of their generative functions.

In like manner, the full term of duration in the different species of the *animal kingdom,* has always been considered to have a relative connection with their periods of gestation, puberty, and full growth. Lord Bacon estimated the length of life among animals, by the time of their bearing in the womb; and Count Buffon calculated the length of their

12 years of age. This being the case with the Mandingoes, who inhabit the hottest tract of the

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lives by seven times the period between their birth and puberty.

It is natural to imagine, that the longer animals continue in the womb, the more they will partake of the mothers' system, and be better prepared to come forth large and strong; but it appears to us, that the correspondence of the whole term of life with the length of the uterine period, or with the time of incubation of the eggs which has been considered as a general law of nature, is not without many exceptions. Cows and horses continue as long in the womb as the human species, who live to three times their age; and geese, turkies, ducks, and partridges, are alike hatched in a month, notwithstanding the immense difference in the length of their lives.

But the correspondence of the period of puberty with the whole term of life, is a law subject to few exceptions. It is said, that fish bring forth a numerous spawn in the three or four incipient years of their life, and continue to grow for scores of years afterwards, and that insects die immediately after their transformation; but these are no real exceptions to the general law of *cito fit cito perit*, with respect to living bodies, which is most distinctly evinced in perfect animals, and has been well expressed by Lord Bacon in his Historia Vitæ et Mortis, by "Nature's finishing her periods in larger circles." The human body, for instance, is longer in the womb, later in shedding teeth, longer in acquiring full stature, and therefore has a more extended life than other animal bodies, which pass through these stages quicker.

burning regions of Africa; they become wrinkled and grey at forty, and seldom outlive 55 or 60 years of age, according to Mr. Park's history of that country. The same thing happens among the natives of the West India Islands, who arrive nearly as early at puberty as the former, and seldom get beyond their sixtieth year: although some solitary instances are not wanting of great age occasionally occurring in these situations. It is a circumstance well known to the author, that Colonel James, the first white inhabitant born in Jamaica, after it was taken from the Spaniards, lived to 105, and his son to 80 years of age, in its then uncultivated state. Elizabeth Brown, likewise, a negro woman, mentioned in the Jamaica Gazette of 1798, died that year at Port Royal, in the hundred and twenty-fourth year of her age. But it must be observed, that the ages of negroes are estimated so vaguely, by the number of rainy seasons, or other past events, that they are not to be depended upon; and although the fact is well established, that the longevity of mankind depends much upon geographical situation, there is scarcely a part of the world wherein a few individuals have not attained the age of a century.

On the other hand, the white people who arrive at Jamaica in the youthful period of their

lives, and escape the ravages of disease, live longer than the blacks. It appears from the Gazette before quoted, that the European Club, who met at Kingston on the 12th of April, 1798, to celebrate the victory of Lord Rodney, consisted of seventy-two members, all of whom had resided 25 or 30 years in that island, after having attained their 18th or 20th year before their arrival there. As a similar instance it may be mentioned, that a Tontine was established in Bengal by Mr. Lambert, in 1786, which consisted of 125 European members, of ages between 20 and 50, and at the end of five years they divided only twelve per cent. among them, the common interest of money in that country; only four of the number had died, in consequence of their being men in the prime of life, who lived regularly, and had a good opinion of their own lives. This is a state of mortality little different from what would be expected in the most temperate climates. Whereas the Hindoos, who live with the greatest sobriety, are shorter lived by ten years, than Europeans in the same climate. So much do strength of original stamina, and the formation of a firm constitution in early life, contribute to resist the deteriorating powers of heat upon the longevity of the human body.

But when we contrast the *Frigid Zones* with the Torrid, we find the changes of puberty seldom take place before nineteen or twenty years of age, and the consequence is, a proportionably longer period in the durability of the machine. The natives of Finland, Norway, Lapland, and Northern Russia, acquire such vigorous constitutions as to be capable of sustaining hard labour at a hundred years of age. It is mentioned in Guthrie's Geography, that four couple were married, and danced before the King of Denmark in the year 1733, whose ages together amounted to 800 years.

We do not, however, consider climate as the sole cause of these instances of extraordinary longevity. That the human species might inhabit every part of the world, bounteous nature has greatly multiplied the variety of their diet, and fitted the healthy organs to digest every species of food, except in the early and late stages of life; but she has, at the same time, established laws for the proper use of aliment, which cannot be infringed with impunity. The inhabitants of warm climates, although plentifully supplied with the cooling fruits and wholesome roots of the earth, indulge too freely in the most stimulating kinds of diet, which accelerate the progress of the body through its different

stages, as effectually as manure does a plant in a hot-bed. Many instances are constantly occurring in our own country, of premature puberty, induced by luxurious living, whereas the growing period is that which requires most attention to the use of simple aliment. The young stomach soon learns to accommodate itself to its daily allowance, and in the quality, taste, and cookery of food, habit assumes dominion over the body for the remainder of its existence.

The advantages to be derived from temperance in diet, even in the more advanced periods of life, are well illustrated by the exemplary precepts of Lewis Cornaro, a Venetian nobleman, who recovered himself from a sickly constitution after his thirty-sixth year, enjoyed good health and spirits, by living on the daily allowance of only twelve ounces of solid food, with thirteen ounces of drink, and died in 1566, in the hundredth year of his age. Besides, it is well known, that the most numerous instances of great longevity are found in all countries, among paupers, gardeners, farmers, and other persons, who are not in the habit of using luxurious and stimulating diet.

In like manner, cold mountainous countries impel men to extraordinary degrees of exertion,

by which they take large draughts of the empyreal stream, and enjoy the genial effects of nature's grand restoratives, sound sleep and simple food. In short, the active habits of climbing, skaiting, fishing, and hunting, together with a plain and hardy fare, in the youthful part of life, contribute greatly to increase the longevity of the rustic inhabitants of Northern regions.

So many external causes co-operate with climate, to extend the span of life, that it is in the *Temperate Regions* where the greatest number of the species arrive at the extreme of old age, and at the best perfection of the living machine. Nay, we may advance a step further, by observing, in conformity with the opinion of the celebrated Haller, that a greater number of instances of longevity are to be found in Britain than in any country of the world, in proportion to the number of its inhabitants.

A morris dance is recorded of eight persons in Herefordshire, whose ages together amounted to eight hundred years. And it appears from a survey of the bills of mortality for London, lately taken by the author of this treatise, that during the ten years ending in 1802, the proportions of old people who died in each decade, were the following:

Out of 197,580 persons who died in *London*, there were

2	above	. . . . . .		120	years.
3	between	110	and	120	——
34	———	100	—	110	——
633	———	90	—	100	——
4,498	———	80	—	90	——

Numerous instances of great longevity are likewise constantly occurring in *Scotland*. The following instances of persons still alive, or lately dead, in the Hebrides islands, and in the vicinity of Montrose, are adduced from Sir John Sinclair's Code of Health: the cold atmosphere, pure sea air, simple diet, and hardy habits of the inhabitants, having contributed to render longevity greatly hereditary in these situations.

Hebrides	5	between	100	and	110	years.
	20	———	90	—	100	——
	15	———	80	—	90	——
Montrose	5	———	100	—	110	——
	11	———	90	—	100	——
	48	———	80	—	90	——

Among such numerous instances of longevity constantly occurring in Britain, it is natural to expect some uncommon great ages must make their appearance therein, during the course of some centuries. Accordingly, two of the greatest instances known are recorded in the Philosophical

Transactions. Thomas Parr, a peasant of Shropshire, died in 1635, at the great age of 152 years and nine months*. He married in his 120th year, and it appeared from the inspection of his body after death, that he might have lived several years longer, if a plethoric state of the lungs had not been induced by his sudden change of habits, from the coarse diet and pure air of the country, to the luxurious living, and dense atmosphere of the palace in London, a few weeks before his death.

Henry Jenkins, a labourer of Yorkshire, died in the year 1670, at the still greater age of 169. He remembered the particulars of the battle of Floddenfield, which happened when he was twelve years old, and he is supposed to be the oldest person, satisfactorily authenticated, in any country since the days of Moses. There are, however, portraits of older persons in possession of William Bosville, Esq. of Welbeck-street, London, as published in Sir John Sinclair's Code of Health. Petrartsch Zortan, a pauper, died in 1724, at the advanced age of 185, in the Temeswar, in Hungary; and John Rovin

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* He died six weeks after his arrival in London. See his Life, by Taylor, Harl. Miscellany, vol. 4, 8vo. edit. 1810.

died in 1741, aged 172, in the same kingdom. But these instances of longevity, with some others still superior in years, are mentioned by Haller, as not being well-authenticated, who considered Jenkins and Parr as the oldest men among the moderns*.

* Haller's Physiol. tom. 8, lib. xxx. p. 104.

CHAP. III.

THE PROPORTIONATE RATE OF MORTALITY IN EACH PERIOD OF LIFE, ACCOMPANIED WITH A FEW PROPHYLACTIC OBSERVATIONS.

THE principles of Longevity will receive some degree of illustration by specifying the general mortality of each period, and taking a retrospective view of our preceding histories, from which the knowledge of prolonging life is chiefly derived.

MORTALITY AND PROPHYLACTIC OF THE FŒTAL STATE.

The mortality of the nine uterine months, if we include those children destroyed at birth, by accidents of labour, and maternal infanticide, will be found not much less than what occurs in the long period of infancy; but we verily be-

lieve uterine mortality to be greatly upon the decline, in modern times, from an improved practice of midwifery.

Various authors have calculated, that the number of abortions, stillborn children, and chrysoms*, make a total of more than a third of the human species. Dr. Bland estimated one of every four children to die before the fourth month of pregnancy, and one of every eight to die afterwards, or in the time of parturition†. The abortions registered in the London bills, although extremely numerous, apply only to those of large size, requiring interment; and our opinion is, that as the greater proportion of abortions happen in the beginning of pregnancy, before the embryo has become firmly attached to the uterus, great numbers of ova, unknown even to confidential medical men, pass off with the catamenia, and the whole mortality, therefore, exceeds all kind of calculation.

The statute law of the United Kingdoms presumes, that human life commences between the fourth and fifth month of pregnancy, and it has therefore been enacted felony, without benefit of clergy, for any person wilfully to administer

* A name used by parish clerks for children who die before baptism.

† Philos. Trans. Abr.

deadly poison, or other noxious substance, with an intent to procure miscarriage of a woman quick with child; but if they shall administer substances, or employ instruments to procure miscarriage of any woman not proved quick with child, they shall be guilty of felony, punishable with fine, imprisonment, or transportation*. Dr. William Hunter gave it as his opinion to the Judges, upon a trial of this kind, that a child may be born alive at any time after the third month, but none were born with chances of being reared before, or until near about seven calendar months. As there are many instances of seven months children living, and becoming as strong as if they had continued the full time in the uterus, it is highly improper to abandon them to a supine treatment, as sometimes happens. The want of hair on the head, or of nails on the fingers and toes, the eyelids shut, and the voice feeble, are not absolute signs of the impracticability of rearing children. Provided the bones be sufficiently ossified to bear incumbent posture, the orifices of the body perfect, and the organs of the throat capable of deglutition, they may,

* Before the 43d of Geo. III. c. 58, to kill a child in the womb was only punished as misprison. The knowledge, therefore, of its being made death cannot be too much promulgated, since it is a practice still very common in this country.

in many cases, be reared, by keeping them in perpetual warmth with stoves, and fleecy hosiery, and by feeding them frequently with a mixture of barley water, milk, and brown sugar; which means, if rigidly persevered in, might ensure the preservation of many valuable lives.

From the whole history of fœtal life it appears, that the fluidity of organs, and irregularities of growth, are the common causes of its diseases; and these, together with abortions, arising from irregularities of the mother's system, occasion a degree of mortality which is proportionate to the imperfection of organization; the prophylactic of the period depends, therefore, upon the attention of the mother to the state of her own health, and to the due nutrition of her offspring in the womb. Mortality, in its greatest degree, prevailing soon after conception, and decreasing gradually as the fœtus gains strength, bears a strong analogy to that which occurs from increasing debility in the latter end of life, when the structure of the body is degenerating.

MORTALITY AND PROPHYLACTIC OF INFANCY.

The mortality of the infant period has always been considered as exceeding that of all the remaining part of life; and it is beyond doubt a

fair statement for populous cities, since the precarious tenure of life is such, that it has been estimated, that half the children born, in every metropolis of Europe, die under three years of age. Formerly, in London, not more than five children out of sixteen, reached their tenth year, but since the act of parliament passed in 1767, for nursing parish children in the vicinity of that capital, the infant mortality has greatly diminished.

The calculation has been made for these kingdoms, upon an average of town and country situation, that half of all that are born die before five years of age. But afterwards, when the destructive enemies of childhood have nearly terminated their course, the body acquires a degree of firmness and activity which renders the remaining part of infancy the healthiest of human life. It is not subject to any particular classes of diseases, unless the rickety, or scrofulous habits be transmitted to it, and the fatality attending them does not immediately take place. Dr. Price has therefore calculated, that between the tenth and fourteenth year, no more than 70 or 80 children die annually in the worst situations, nor more than 150 or 160 in the most favourable; whereas, the mortality of the whole of human life is, one year with another, gene-

rally estimated at rather more than the death of one person in thirty, in all situations collectively*.

As the human body is capable of deterioration, or improvement, with respect to its health, strength, and form, by different modes of treatment, it occurred to the Author that many of his readers might expect something to be said on *Prophylactic;* but preventive rules have been so frequently proposed, and errors in rearing the species so ably combated by Armstrong, Underwood, Beddoes, and other physicians of great experience and authority, that he has merely suggested a few cursory observations of a general nature, which have arisen out of the history of the changes of the body, and its predispositions to disease, in the different periods of life.

The remark of the learned Celsus, derived from the accurate observation of Hippocrates, that the infant mortality is greatest about the fortieth day, and the seventh month after

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* The annual mortality of eighteen different places in town and country throughout Europe, has been estimated by Dr. Haygarth at one in 30 ½. Phil. Trans. Abr. vol. xiv. p. 314. The population of places may therefore be discovered, by multiplying the annual deaths by the number thirty-one.

birth*, shews the importance attached to early prophylactic, for preserving health and attaining long life. This observation of Celsus can have no other allusion than to the diseases of the bowels, and the convulsive fits of the first months, together with the dangers of difficult dentition, immediately succeeding, all of which we daily discover to have the most destructive effects, especially in large cities, from abuses of diet—impure states of atmosphere—inattention to cleanliness and clothing—and confinement of the fluid organization, in early infancy.

Artificial modes of *Diet*, from the erroneous treatment of conceited nurses, and the indulgences of timid parents, are the bane of incipient life in polished society, more than among savage nations. Grown persons learn from experience the regimen which best suits their constitution, but the care of passive infancy is intrusted to those, who are too frequently slaves to prejudices, and prevailing fashions, or who are misled by their feelings, without exercising their rational powers. We, therefore, not uncommonly find the natural debility of the alimentary canal after birth greatly increased by food, improper both in quantity and quality. The frequent calls of the appetites of children are either too much neg-

* Celsus de re Medica, lib. ii. cap. 1.

lected, or their stomachs are surcharged with food, to lull them to a state of quietude. To bring up children by hand, without an urgent necessity, or to commit them to the care of foster-parents, are unnatural practices, which cannot be too much reprobated. And no part of infant management is so much at variance with the laws of nature, as the denial of the mother's breast. The milk is prepared in quantity sufficient to support the infant system, and is impregnated with those proportions of saccharine matter, and phosphate of lime, which render it the properest food for the weak stomach and grisly bones of the first age. Nature has even pointed out the gradual manner in which it ought to be changed to more solid aliment, by the slow development of the teeth.

Impure Atmosphere, in the acute sensibility of the surfaces of the body, proves a principal source of the mortality of the early part of infancy. Children frequently come forth from their nurseries, like tender exotic plants, incapable of resisting the natural variations of weather, and at an age when the tonic powers of the atmosphere are most required, as well within as without doors, to strengthen the irritable surfaces and feed the vital spark. It is the free access to external air that renders

warm climates more congenial to infant vitality than cold ones; and gives children of our own country, born in the spring, greater chances of living than those born in winter; since the latter are liable to suffer from confinement in warm chambers, or to contract diseases from a humid atmosphere.

Mankind, at every age, enjoy the best health when they are most exposed to the weather, and become subject to the greatest number of diseases, when the seasons confine them to the house; but at the same time they must have been inured to the influence of weather in a gradual manner. So variable is the climate of Britain, that the cold easterly winds from the continent, changing to south-west winds from the Atlantic ocean, occasion, at times, a difference of twenty-five degrees of temperature in one day, which renders cattarrhal and pulmonic diseases endemics of our island, even in the early period of infancy. But warm moist weather is particularly fatal to infants, in producing croup; and a mass of impure and heated air, applied to the passages of the nose and lungs in the nursery, is not less so in predisposing to inflammations of the mucous membrane; whereas, they ought to be fortified as much as possible against the influence

of climate, by an early and gradual application of a dry elastic air to the pulmonary and cuticular surfaces.

No age requires greater attention to the *cleanliness and clothing* of the skin than early infancy. To wash the greatest part of the body with cold water daily is, without doubt, a necessary and salutary practice, as it cleanses it from the impurities of the first age; but this ablution ought, in most cases, to be succeeded, in less than three or four months, by cold immersion, as a more powerful preventive of diseases. The sensibility of the skin likewise requires particular attention to the manner of clothing. The constriction of the infant body, by tight clothes fastened with pins, immediately after its removal from the gentle pressure of the protecting fluid of the womb, occasions many of the cries of children, generally attributed to hunger. It is evident that severe crying is more the language of pain than of appetite, and very commonly arises from an acute sensation of the skin, it therefore becomes highly expedient to accustom children to loose and warm clothing, without pins, until they become inured to the inclemency of climate. In like manner, the degree of sensibility possessed by the skin, even in more advanced years, renders it necessary to attend to the proportion of

punishment they are capable of bearing, for the correction of their faults, at home as well as at school.

Muscular Movement is of the utmost importance, whereas the slender texture of the muscles and bones is too often injured at this age, by pressure and inaction. The changes in the posture of children in the nurses' arms, and during their sleep, have not been sufficiently regarded, since carrying them continually upon the same side of the body has, at times, laid the foundation of incurvated spine, and permitting them always to sleep upon their back, with a loaded stomach, is liable to occasion dangerous pressures of the slender viscera, one upon another. Some medical men even prefer the old custom of gently rocking in a cradle, to the modern improvement of swinging at the side of the bed in a cot. That children were not intended to continue long in one position, appears, from the restlessness they manifest when they have acquired strength sufficient to move themselves.

That the wheel of life may always revolve upon its axis, motion has been rendered congenial to infants from birth. They receive pleasure from carrying about, and particularly from the salutary practice of tossing in the nurses' arms. And to give them the use of their limbs as soon as possible, they should be encouraged to

crawl upon the carpet, or floor of the room, before they attain the power of standing or walking alone. The author has seen negroes in the West Indies remarkable for fine shapes and upright gait, working in the field, with infants of four or five months old clinging to their breast, or crawling on the ground at a little distance from the mother, during the greatest part of the day; and by such habits they learn to walk much sooner than the children of European nations. The practice of fettering the limbs of children in this country with irons, if due regard be not had to the free motion of their muscles and joints, instead of increasing their ability to walk, will be more liable to retard their increase of strength. Curvatures of the legs, and weak joints, will sooner receive benefit from cold bathing, rubbing with the hand, and keeping them in continual movement, than from any other means of prophylactic.

Infants have no sooner escaped from the confinement of the nurses' arms than their activity inclines them to ramble about, and thereby exposes them to new sources of mortality. They become more liable to the infection of exanthematous diseases, and to injury from various accidents, which might be obviated by cautious modes of management. Thus we see them daily

committed to the care of children little older than themselves—they climb on every insecure body near them—play with edge weapons—or tumble into the fire—which might be prevented by guarding the windows and fire-places with iron bars, and placing them under the direction of elderly persons, until they acquire experience and reason sufficient to guide themselves.

The healthiest period of human life, the *second epoch* of infancy, when the destructive enemies of childhood have nearly terminated their career, is the appropriate time to lay the foundations of a hardy constitution. If any hazard is to be encountered to obtain an essential good, this is the age. The animal spirits are abundant, the renovating powers of the system vigorous, and the body yet in a state of preparation for a more perfect existence. Hence the proper regulation of the digestive powers, lungs, skin, and bones, is of much greater importance at this period for health and longevity, than any attention that can be given to particular modes of eating and drinking in subsequent years. Mankind, by a scrupulous attention to trifles of little moment, too often neglect essential considerations of this kind, which, with very little risk, would pave the way for the enjoyment of a number of happy years.

The *appetites* and propensities of children frequently determine them to do that which is most conducive to the expansion of their corporal and mental faculties. They possess at this age great activity, accompanied with a keen appetite and a powerful digestion, in relation to the size of their body, and they therefore require copious supplies of nutriment to forward their growth. And that the functions of the organs may at the same time be preserved in the soundest state, they must be kept in perpetual action, and the stomach frequently supplied with food. But as diet soon comes under the dominion of habit, and the stomach afterwards claims that to which it has been early accustomed, it ought not to be altogether of the animal kind, a species of diet which has so often given rise to gout, and other endemial diseases of Britain. Nature has appointed the regimen of life to commence with milk, to consist chiefly of vegetables, with water for drink, particularly at this age, and to become gradually more stimulant and alkalescent, as years roll on. Vegetable diet alone might be sufficient to sustain the waste of the system, and increase the springs of life, when the digestive powers are strong, but the rickety and scrofulous states of the body, which so frequently appear in this period, most commonly require a more nutritious

diet, probably of animal food alone, to rouse the feeble energies of the system.

It is never to be forgotten, that nutrition depends as much upon the state of *the lungs,* and capillary vessels of the skin, as it does upon the digestive organs, in perfecting the machine. Exercises which employ body and mind in the open air, such as leaping, skipping, running, and ascending heights, &c. are the most effectual means of expanding the chest, and promoting sound sleep, in which the body receives its greatest increase. Going early to bed, breathing a free air in the night, without the interruption of bed-curtains, and rising early in the morning to inhale the pure stream of vital gas, which issues so copiously from the vegetable kingdom at that time, likewise contribute to give elasticity to the springs of life, and to augment the capacity of the thorax.

The induration of *the skin,* and diminution of its sensibility to impressions of climate, can be more safely attempted in this than in any other age. Boys, like most young animals, have a natural inclination to bathing, which becomes a powerful means of hardening their constitution, although the practice is too often prevented by timid parents. The immediate advantages to their health, in learning to swim, cannot be too

much appretiated, but the safety afterwards to be derived from it, especially to naval and military men, is incalculable. Girls should also be accustomed to brave the elements, and to cold bathing. It will conduce more to their future happiness than confining them in heated rooms, or close carriages, and sacrificing their health at the shrine of fashion and delicacy.

The bones may be moulded to any shape in this age; and nature does little for the removal of their diseases, which, on most occasions might be averted, by attention to air, exercise, and proper management. It would certainly improve the pulmonary system in boys, to liberate their chests from the confinement of clothes, and to expose it at all times, to the tonic powers of the atmosphere, it could not be more hazardous to them than it is to girls, who do not receive injury from the habit. Whereas a variety of stooping employments, or close confinement for six or eight hours to the forms of a cold and damp school-room, labouring hard at dry and abstract learning, must, on many occasions, depress the natural spirits, degrade the active powers, and injure the soft bones of the youthful system. The insidious diseases of the bones are liable to commit ravages upon the female constitution, before the parents are aware of the danger. Con-

tractions of the female pelvis are often induced in infancy from sedentary habits, which are not discovered until they become fatal at the period of delivery. The elegance of the female frame will be better sustained by drilling, dancing, and by frequent walking in the open air, than by sedentary habits, or by whale-bone stays, back braces, and pinioned arms, without exercise in the fields.

MORTALITY AND PROPHYLACTIC OF YOUTH.

The mortality of this age, compared with the other periods of life, is of little estimation, but the numbers of deaths increase gradually from its commencement at puberty, until its termination with the 28th year. For every year brings with it, not only the chances of one year against the life of the individual, but also chances, which augment more and more every subsequent year; as appears from the decrement of expectations in the foregoing tables, which we are now to explain.

The exuberance of life, and strong vital energies succeeding the healthy part of infancy, render the beginning of the period of youth remarkable for exemption from diseases. Few oc-

cur except those from the continuance of scrofulous action on the glands, bones, and lungs, and from the commencement of sexual excitements after puberty. But as the period advances, we find unruly passions, unhealthy occupations, and various circumstances incidental to the age, swell the catalogue of human mortality, which proceeds with equal pace in both sexes.

The danger to males, from indiscriminate venery, military employments, and casualties of life, so nearly balance the mortality from uterine derangement, in females before the twenty-fifth year, that no very remarkable difference can be discovered in the deaths of the sexes from the tables. Certainly, no particular fatality attends the state of pregnancy, but it is perfectly obvious, that the act of parturition increases female mortality to a considerable degree, in many situations. Thus, it appears from the mortality of the hospital in Brownlow-street beforementioned, that it was equal to one death in a hundred and sixty patients, on the first establishment of the institution, but by improved modes of management decreased at last to one in 228 labours only, which is so small a number as scarcely to deserve notice in general calculation.

Two principal objects of prophylactic present themselves to our consideration in the period of youth. To promote a perfect development of the machine, when it is acquiring its acme, and to restrain the impetuosity of passions and desires, which take place after puberty.

The formation of a *capacious chest* in males, so very essential to the free action of the vital organs and strength of body, was considered as one of the causes of the great ages of Parr, Bayles, and Jenkins, who were laborious men. We suppose dancing, fencing, dumb-bells, spouting, and reading aloud, especially when persons are intended for public speaking, must greatly contribute to the expansion of the chest; but to fashion the bony fabric, and consolidate the machine, exercises in the open air, particularly those which call forth the energies of mind, as well as the exertions of body, will be more effectually obtained at this age by riding, fishing, military exercises, and the sports of the field.

We particularly observe the effects of tender education and sedentary habits upon the constitution of females, who are more subject to rickets and scrofula than males. The elegance of the female frame will be better attained by walking in the open air, reading their book in the fields,

riding on horseback, and by using the cold bath, (other circumstances permitting), than their habits of confinement all the day to the house, and their appearance immediately afterwards in the night air, in diaphanous attire. A sloping couch, occasioning a posture between sitting and lying, has frequently been of great service to young ladies, on the first appearance of deformities of the spine, and has tended to give them an upright carriage. Mr. Calam's reclined plane appears to be one of the best contrivances of the kind, upon which they lie in a straight position on their back, supported by a strap under the chin*. Young persons are extremely liable to become crooked by standing upon one leg, when they are learning their lesson, which will readily be obviated, by placing them several hours every day on this machine, while they are perusing their book.

Many have supposed that the practice of *shampooing*, so highly esteemed in India, might be in-introduced with great advantage into this country, to improve the agility of the body, and prevent

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* It is a hard mahogany couch, which can readily be elevated or depressed at the top, according to the circumstances of the case, and may be seen at Mr. Calam's the inventor, No. 19 Little Queen-street Holborn, London.

diseases. A person, with great dexterity cracks all the joints of the body by pulling and twisting them. He puts his knee against the concavity of the back, and by pulling the shoulders with an oblique motion, occasions the articulations of the spinal column to make a noise: likewise, by pressing and pummelling the skin and flesh of the different parts of the body, a free circulation of blood immediately followed by sensations of delight, and a freer motion of parts. The great success of Mr. Grovesnor of Oxford, in curing diseases of the bones and joints by friction, is much in favour of this practice, as a mode of prophylactic.

To restrain the *passions of mind* is a more difficult undertaking than to improve the body. We frequently observe male quadrupeds remarkably courageous, and impelled by furious desires after their arrival at puberty; but a lively imagination and the social principle, render love a much stronger, and more durable passion in human beings, than in any other species of the animal kingdom. Consumption, tabes dorsalis, tremors of the nerves, and premature old age, are not unsual consequences of sexual excitement among the youth of the present day, while madness, melancholy, and sometimes suicide,

are the frequent result of disappointed love, in persons of more mature years.

Unfortunately, neither the sedative powers of leaden girdles, the antispasmodic virtues of camphor bags, nor the cooling properties of nitre, have any other than an imaginary effect in subduing this powerful passion, which requires the exertion of the rational faculties to give a proper direction to the laws of nature. Hence arises the utility of a virtuous education to restrain unruly passions, particularly when youth begin to throw off the authority of parents. The principle of shame, and habits of self-denial, ought to be strongly impressed on the young mind before the arrival of this age. Dissolute companions, dalliance between the sexes, and the high-coloured extravagant fictions of some novels, which inflame the imagination, and excite a state of morbid sensibility, ought to be cautiously guarded against. The passions awakened before their natural season are the common destroyers of youth of both sexes. And after they are fully established, too much attention cannot be had to the choice of proper associates, and the selection of the best recreations. To keep the mind and body in a state of constant employment, and to observe temperance in diet and drink, are the most essential

correctives of the inexperience, enthusiasm, and impetuosity of passions, in the youthful age.

The married state is of great importance to health and longevity, as well as to the felicity of mankind; but it must not be entered into incautiously. Neither very early nor late marriages are conducive to long life, for children and old people were not intended by nature to become parents at ages, when they are incapable of providing for an offspring. Marriages, therefore, which take place at sixteen or seventeen years of age, are often prejudicial to the health, and frequently to the fortunes of the parties. Perhaps the best ages, all other circumstances being favourable, may be between the 18th and 25th year for females, and between the 25th and 36th for males. The body will then be in its most complete state to propagate a healthy offspring—the ages when the prolific powers begin to cease in both sexes, will nearly correspond—and the probable expectations of life will be sufficiently long for parents to get their children provided for.

It has often been remarked, that almost all the instances of extraordinary longevity, have been found in persons who have been more than once married, while comparatively few bachelors have attained extreme age; most probably owing

to the greater regularity of life in the married state. But marriages are not to be recommended where either of the parties are tainted with hereditary diseases, particularly with those of the inveterate kinds, as scrofula, epilepsy, mania, gout, consumption and leprosy. They are also ineligible in other states of the body, not usually considered as diseased ones; such as the male being sensible of impotency, or the female of a crooked pelvis; or when both male and female are of a squat corpulent habit, with short necks, which predispose to apoplexy. If temperaments be attended to, the most appropriate union will be the sanguine with the melancholic, since two persons of a highly sanguine temperament, will be liable to generate scrofulous children; and two of the melancholic temperament, to produce dyspeptic diseases, and a gloomy disposition of mind in their descendants.

THE MORTALITY AND PROPHYLACTIC OF MANHOOD.

The mortality of this period, which continues from the age of twenty-eight for a term of twenty-eight years, or longer, depends more upon contingent circumstances of life, than upon

any imperfection in the structure of organs. The solids have acquired so much firmness and strength, as to counteract the operation of external causes better than in former ages, but still the chances are gradually increasing against the life of the individual. This we do not attribute to the machine wearing out after the age of fourteen, and becoming gradually more incapable of resisting the action of destructive powers, as some authors have supposed *; on the contrary, it appears from our previous history, that the body is not completely formed at that age, but continues to acquire strength and vital energy, for more than twice fourteen years. The increase of mortality is, therefore, to be ascribed to the exposure of the machine to violent injuries, and to other causes of premature destruction, which multiply in number during the greatest part of the period.

Not only are the diseases of the first part of manhood of a more acute and dangerous nature, from increased strength of muscular power, as we perceive in the frequency of violent fevers and inflammations; but many new ones arise from the immoderate exercise, or destruction of particular organs. The stomach suffers from glut-

* Dr. Price's opinion.

tony—the brain from excess of mental exertion—the lungs from hereditary consumption—and the limbs from gout.

The ardent pursuits of men after pleasure, luxury, and gain, greatly multiply the hazards of life. Thus, the nervous system is destroyed by excess of amorous enjoyment—a train of mental diseases succeeds to idleness, and violent passions. The biliary organs exhibit the baneful influence of intemperance and solar heat, upon their structure and secretions—Anxieties of mind increase with contending interests, and numerous unhealthy trades, vices, executions for crimes, and accidents, swell the catalogue of human mortality, as the battle of life rages more intensely. In the single instance of horses, the numbers of the human species destroyed in the prime of life by these useful animals, is almost incredible.

But towards the end of the period, when the body retrogrades, the organs change their character. The seeds of disease lurking in the habit, perhaps from early life, become of more serious import, as the powers of the system decline. A morbid tendency takes place in the abdominal viscera, and in the uterus, ovaries, and breasts of women, which augment the mortality still more.

Little can be deduced with respect to prophylactic from the physiological changes of a period, in which the body is nearly stationary. Our attention is naturally directed to *Regimen*, or the proper adjustment of the ingesta and egesta, to prevent the dangers of repletion and inanition. Almost every old person has some peculiarity in his modes of living, to which he is apt to attribute his health and longevity, but a precise uniformity in the use of any species of diet, has the contrary effect, by exposing the body to injury, from the sudden alterations which are incidental to human life. Hippocrates observes, that our chief care should be, not to oppress the system with much eating and drinking, nor to neglect the labour and exercise necessary for discharging them. We therefore find the greatest number of instances of longevity, which arise from the management of the system in adult years, occurring among temperate livers, early risers, great walkers, and persons of tranquil mind.

Corpulency abridges the chances of longevity very considerably. Persons of short stature, indulging in much animal food, and leading indolent lives, are liable in this period, to have the functions of the vital organs disturbed with fat, which becomes extremely difficult to prevent,

and more especially to remove, on account of the torpor which accompanies it. But there are many instances of persons, who have reduced the bulk of their body a full third, by vegetable diet and exercise alone, with perfect safety to their health. The celebrated Dr. Cheney of London, in a state of bad health from growing to the enormous size of thirty-two stone, at the age of thirty-five, and requiring the entire side of his carriage to open as a door to admit him, reduced himself ten stone by change of regimen, and afterwards enjoyed good health merely by a strict adherence to the use of milk, vegetable diet, and exercise, until the time of his death, in the year 1742, at the advanced age of seventy-three.

Mr. Bright of Essex, who was fat from his infancy, increased to the weight of forty-one stone, although he was in constant habits of great exercise; but he drank every day a gallon of beer, had a keen appetite, and neglected his exercise three years before his death, which happened in 1750, in the thirtieth year of his age. Daniel Lambert, the most bulky man whom this, or perhaps any other country ever produced, became corpulent soon after twenty, although the days of his youth were spent in shooting and hunting. He ate and slept moderately, and drank only water; but paying less attention to

exercise and regimen, some years before his death, he died suddenly of corpulency in the year 1809, at the age of forty, when he was found to weigh fifty-two stone, or seven hundred and thirty-nine pounds. It may not be inexpedient to remark here, that water drinking, by improving digestion and begetting costiveness, has sometimes a greater tendency to increase, than to retard the accumulation of fat. Cream of tartar drink is therefore, much better calculated to become a useful beverage in such cases, than water.

The author has little doubt, that the lives of these men might have been prolonged for a greater number of years, if they had submitted to the rigid discipline generally employed for training pugilists. This practice has arrived to such great perfection in this country, as to throw new lights on the physical changes which the body is capable of receiving from prophylactic, even in advanced years. Besides the occasional use of emetics, purgatives, and sudorifics, the training art consists in a rigorous perseverance in habits of simple diet, moderate sleep, and severe exercise. The vigour of the body is augmented by animal diet and muscular exertion—the respiration improved by lessening the size of the body—and the skin cleared from its

impurities, and so much improved in elasticity, colour, and tone, in the space of two or three months, as to denote the perfection of the art, and to determine the time that may be required for the continuance of training.

When *the Eyes* become weak in the end of this period, they may be preserved by using at night a shade over the candle, to darken the upper part of the room, and prevent the yellow-making rays from impinging in a direct manner upon the pupils: and likewise, by keeping the bed curtains open in time of sleep, that the eye-lids may be exposed to the tonic powers of the atmosphere. The convexity of glasses is generally increased as the cornea of the eye continues to flatten; but it sometimes happens, that persons who have used spectacles many years, are able to lay them aside after 80 years of age; and instances of this kind have been quoted by authors, in proof of a regenerating power in the end of life: we are however, inclined to ascribe it to a change in the configuration of the globe; it is most probably elongated by sinking in the socket, from the absorption of its bed of fat.

THE MORTALITY AND PROPHYLACTIC OF OLD AGE.

This is the period in which the whole of mankind are extinguished, for of any given number at birth, all will be dead at the 80th year in London, and the 96th in the country; the instances of longer duration being so few as to be neglected in general calculation. And so rapid is the mortality, that it appears from the tables, the remaining expectations of life at the commencement of old age in the 57th year, are only thirteen years for London, and fourteen and a half for the country.

The mortality of this period, like that of infancy, arises chiefly from its organic imperfections. Certainly there are no rickets, scrofula, worms, nor exanthematous diseases, appertaining to old age, but other morbid structures of a more dangerous and rapid nature, occur. These however are more seldom met with than the diseases of the other periods: it would, indeed be an unpleasant task to detail the excruciating disorders incident to the body, at an age least able to combat them, if we did not at the same time reflect upon the inconsiderable

number of persons who arrive at extreme old age, and the few of those who labour under tormenting diseases for any great length of time*.

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* The *Mortality of Plants* from disease, is very inconsiderable, compared with that from other incidental causes, except it be from imperfection of structure in the period of old age. Their internal diseases are always few in comparison of their external ones, from their possessing no means of defence against vicissitudes of weather, and the depredations of other living creatures.

They no sooner arrive at the light of day, than their feeble and succulent structures are attacked by easterly winds, which absorb their moisture, contract their vessels, and render them an easy prey to insects. They sometimes recover at this age from defoliation, in favourable soils and seasons, but they seldom acquire leaves sufficient to become vigorous. On the contrary, they soon exhibit signs of emaciation, similar to the effects of interrupted respiration in young animals.

In middle age, they are chiefly destroyed by external violence. Their roots concealed in the earth, when situated deep enough to imbibe sufficient nutriment, are little subject to diseases, but they are often famished with droughts. The destruction of their cortical part by wounds, fractures, mutilations, lightning, and other external injuries, or by diseases from insects and their secretions, are the principal sources of their mortality, in the perfect state of their structure.

In old age they generally die from internal disease, or their feeble organs are overpowered by parasitical plants. Misletoe, weeds, fungus, and moss, prey upon their scanty juices,

The prevailing opinion among the aged, that all their diseases are symptoms of age, and that

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and stop the pores of their skin. When their leaves drop off, they have no powers to renew them, and they become subject to gangrenes, marasmus, and cancer, &c. from languid circulation, defective æration, and imperfect juices.

The means of prolonging the lives of plants is, to improve their vigour in early life, and to shelter and protect them from injury in the latter stages of their existence. These objects can be best accomplished by a soil of good heart—free exposure to light, air, and agitation of the wind—ablution with cold water—occasional change of situation—excision of their branches—and the preservation of their skin and foliage from parasitical plants, and sudden colds—which are means of prophylactic not very dissimilar to those employed for the human system.

The *Mortality of large Animals* from disease, is also much less than that of the human species, in consequence of the prone position of their organs—a more vigorous state of infancy—a greater simplicity of structure, being less under the influence of brain—and the more natural modes of their living. But as they become domesticated and approach the habits of men, accidents and diseases are more liable to abridge the natural span of their existence. They are chiefly destroyed by the human species, or devoured by other animals before they arrive at old age. Their internal disorders are also extremely obstinate, and for the most part fatal, owing in great measure to our little knowledge of their nature, which has occasioned annual premiums to be offered by agricultural societies, for treatises on the subject.

medical assistance can be of no avail to them, is completely erroneous, since it is greatly in the power of the faculty to obviate the insidious attacks of dyspepsia, rheumatism, and stone, as well as of many pulmonary and ocular diseases, peculiar to the period; and those cases of cancer, mortification, dropsy, appoplexy, and palsy, or even the diseases of the vital organs, which invade the latter stages without chance of recovery, may either be alleviated, or their improper treatment prevented, by the advice of medical men. It may not be necessary to offend the taste, and irritate the stomach of old people with frequent doses of medicine, although some persons estimate the value of medical attendance in no other way; but it is reasonable to suppose, that when nature does least for herself, she most requires the aid of skilful management. It is, besides, an important part of the physician's practice, when he cannot save life, to assist in mitigating the last sufferings of humanity, and to render the act of dying as easy as possible.

With respect to prophylactic, there are many peculiarities occurring, from the variety of ailments incidental to the period. Warm clothing is of great service to old people in general, on account of the flaccidity of their skin, and the contracted state of its circulation, which was

well observed by the ancients, who used warm clothing, hot bathing, inunction, and friction, as sovereign antidotes to the infirmities of age.

Habits of hardihood, with respect to *Clothing*, are safe and necessary in youthful years, during the accommodating state of the constitution, but after the age of fifty-seven, when the renovating powers of the machine are rapidly declining, all perilous exposures of the body become acts of folly; and true wisdom consists in rendering it as comfortable as possible, for the few remaining years of life. The external circulation certainly requires greater assistance from clothing, and the internal energies of the system need more support from a cordial regimen, than in younger years. Hence modern fashions, and the desire of appearing young, which so often prevent old men from wearing great coats, and other guards against the vicissitudes of weather, are not so congenial either to the sensations of the skin, or to the preservation of life, as the old customs of house screens, woollen caps, worsted stockings, periwigs, gallaches, and roquelaures. This opinion receives additional proof from the familiar observations, that old people die in greatest numbers in the winter months, and particularly in the coldest years, even when clear and frosty; and

that many men prolong their days, by removal to warm climates in the evening of life.

Warm Bathing is likewise beneficial to old age, by promoting an external circulation, as well as by cleansing the skin from impure secretions. It has been highly recommended by many authors, and by Dr. Franklin in particular, who experienced great relief from it in his latter days. It removed the torture of stone, relieved the infirmities of the period, and enabled him to live to the great age of eighty-four.

When we consider that the human body commences nearly in a fluid state, and grows gradually more and more dense by the actions of life, until the organs are no longer able to perform their functions from rigidity, we can account for the utility of different baths, and for their general operation upon the various states of the body, as they occur in the succeeding periods of life. During the first twenty years of human existence, the soft stamina, in a state of preparation for more mature functions, become subject to diseases of laxity and debility, and they therefore derive greatest benefit from the stimulating and condensing powers of cold water. In the next twenty years, the solids of the machine, in their most perfect and vigorous state, become liable to fevers, and inflammatory diseases, the

body therefore receives greatest benefit from the mild operations of a tepid bath. And in the last twenty years of human duration, the rigid materials in a state of decay, subject the body to diseases of debility, and ill performed actions; and it receives greatest benefit from the warming and softening powers of the hot bath.

Lord Bacon strongly recommended the application of *unctuous substances* to the surface of the body, particularly in old age, as a powerful means of obtaining long life; which, he said, operated in preventing the waste of perspiration, and the depredatory action of the ambient air, in hastening the desiccation of the body. That its use might not heat the body, he advised it to be accompanied with gentle purges, which would also contribute to longevity, by soliciting a supply of new juices*. And a late author says, "that friction of the whole skin with sweet-scented and strong unguents may be employed with advantage, to lessen its rigidity, and preserve it in a state of softness †." It was in general use among the Greeks and Romans for persons of all ages. Their wrestlers and boxers besmeared

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* Baconi Verulamii Opera. Historia Vitæ et Mortis.

† Hufeland's Art of Prolonging Life, Vol. II. p. 324.

their skin with oil, and the people of rank with odoriferous unguents; but the Athletæ were not so long lived as their contemporaries; and the inhabitants of ancient Greece and Rome are not remarked for greater longevity than their descendants of the present day, who have long discarded the fashion. It is employed with great advantage in modern times, for the cure of diseases, such as dropsies, plague, and the bites of venomous animals; and is held in great estimation as a part of daily regimen, in eastern countries, and for protecting the skin of naked savages. But as a means of prolonging life, we have no evidence that it is of greater value than all the other nostrums, which have long been abandoned. It is a practice inconsistent with modern ideas of cleanliness, and does not appear to possess the salutary properties of shampooing, simple friction, and the frequent renewal of flannel waistcoats.

Friction may be employed to great advantage in the languid state of the circulation, and swellings of the lower extremities of old people. Rubbing their legs with the flesh brush for half an hour night and morning, until it produces a glow, or with the palm of the hands, guarded with flour or a leather glove, will prove an excellent means of strengthening them. Warming

the feet on going to bed, and sleeping with stockings, are also necessary requisites for the repose of the aged, in the cold nights of winter.

A plan of *Dietetic Regimen* is always of great utility to aged people, on account of the decay of their digestive organs, and the loss of their teeth. The general law of nature, which requires the food to be proportioned to the waste of the animal system, renders less of it necessary when the body is shrinking and diminishing its muscular exercise, but it is required to be more restorative and less flatulent, than formerly. Indulgence in suppers is less safe to old people than others, on account of the natural tendency of the age to plethora in the head and lungs; and warm laxative medicines are, in the greatest number of instances, expedient for the flatulent and constipated states of their bowels. Ipecacuanha powder has been recommended for the failure of digestion, in small doses of one or two grains daily repeated.* And there is little doubt, but this medicine may be rendered useful on many occasions, as well for the lungs, as for the alimentary canal, in the declining powers of these organs.

* A small tract has lately been translated from the French of Monsieur Daubenton on this subject.

To retain *Teeth* is a matter of great importance to old people, since the failure of digestion is in great measure owing to the want of them. When they are nearly gone, it becomes necessary to take as much time as possible to comminute the victuals, instead of yielding hastily to the habitual claims of the stomach; and people as they grow old must necessarily accustom themselves to the use of a softer diet. Although the teeth contribute to perfect digestion, and distinct articulation, the continuance of a good set cannot be considered as an indication of the duration of the body, as many have supposed. Of ninety-six mariners alive in Greenwich Hospital in 1806, who exceeded eighty years of age, fourteen only had good teeth, and several had lost all their teeth for twenty years or more, notwithstanding nearly the whole chewed tobacco, which is one of the best preservatives of teeth known*. Their decay has no connection with the failure of the other bones of the body, but depends chiefly upon casual circumstances, and the modes of their management. Attention to their regular appearance in the second dentition—the daily use of the tooth brush with cold water—removing

* Sir John Sinclair's Code of Health, Vol. II.

decayed ones before they injure the others—replacing those which are lost, by artificial ones, even in old age, when it can be done conveniently, are the best means of prophylactic.

Mankind naturally diminish their *Exercise* as their joints increase in rigidity, and their muscles lose power; it is however expedient to counteract the torpor which gradually steals on old persons. The general wish of men to devote the evening of life to ease and reflection, is a mistaken idea of happiness, since existence becomes of little value to the possessor, and of still less to the community, in proportion as it loses its relation to external things. Nothing can be more common than to see men toiling through a tedious existence, flattering themselves with the hopes of retiring from business, to enjoy the sweets of the country at a distant period, and when they have accomplished the desired object, become less happy than before, or they abridge the natural span of their life by inactivity, and sudden change of habits. Experience however soon teaches them, that employment is the only opiate of mans' repose. Some take to gardening, agriculture, or housebuilding, while others, soon return to their money-getting occupations in town.

Nature admits of no intermission in her activity, without punishing the transgressors of her

law. It is certainly necessary for the health and happiness of old people, that they should continue in daily habits of exercise, without incurring great fatigue, and keep themselves employed in some mental pursuit, within moderate limits, until the very last extremity of their existence. There is no stage of life to which some duty does not attach, either of a private or public nature. The aged, when deprived of more active employments, have always an opportunity of communicating their experience to the younger branches of a family, and the rich can employ themselves in performing charitable offices, when their fortunes are less wanted to contribute to their own happiness. But it too frequently happens, that the balance between the social and selfish affections, so admirably useful in regulating the active duties of life, is not properly adjusted in this age of parsimony. The experience of many years is liable to render men distrustful, as well as callous to the misfortunes of others, and the increasing timidity of the age, inclines them to hoard their money, as a security against want, or for the purposes of retaining the attentions of mankind; but these passions in many instances, exceed the bounds of happy mediocrity.

The usual exercises of the latter stages of life are walking, and riding in carriages; but the

author has frequently observed in the country, that riding a saddle horse, as long as a man can mount his back, is the most effectual antidote to the hypochondriasm, indigestion, and wakefulness of the age. There are many men above eighty years old riding about the country of Cheltenham, who derive their chief happiness and length of life from horse exercise. But nature gradually withdraws her powers of action, in proportion as action becomes hazardous to existence, for strong exertions are often fatal to vertiginous states of the head, and organic affections of the heart, which require that the exercise shall be gentle, regular, and properly adapted to the states of the system in its last stages. And for the same reasons, violent passions are extremely dangerous in the end of life. It is always necessary to support a proper stream of mental energy, especially when it has a tendency to stagnate, but it requires equal care to restrain its current, when it happens to be too rapid. A short nap after dinner in the erect posture in a chair, with the head gently reclined, will not only recruit the powers of the body, but will sooth the animal spirits, and contribute to induce a placid state of mind.

Cheerfulness conduces greatly to the prolongation of life, and it never appears to so great ad-

vantage as when it enlivens old age. It denotes a happy combination of contentment and hope, which, like other exhilarating emotions, increases the vital and nervous energies; whereas, a fretful and peevish temper too often indicate mental pain and dissatisfaction, which have a tendency to diminish the natural and vital actions. It is certainly an inconsiderate species of folly, for old people to let trifles rob them of their tranquillity and health, for the few remaining years they have to live; and to alienate the affections and respect of surrounding friends, upon whom their comforts chiefly depend. The ancients considered the gravity of age as the natural consequence of experience and sagacity, but true wisdom consists in counteracting the gloom of declining years; and we certainly have it in our power to bring a chearful temper under the dominion of habit, by culture: we, therefore, find it prevailing most frequently in men, who regulate their lives by the dictates of religion and virtue.

However natural it is to dread the termination of the existence of the body, *the Fear of Death* is a depressing passion, when it prevails in a great degree. It prevents the attainment of long life, and has been known to induce in some people, melancholy madness: its continuance diminishes the power of the heart, and ex-

haunts the nervous energy. The apprehension of a painful dissolution is impressed upon all men, as a guardian of their lives, and many divines inculcate the necessity of its constant remembrance, for the good of their souls But it can never be the intention of nature for men to destroy their own happiness, by the perpetual foresight of a real or imaginary evil; the impression, therefore, loses force as it becomes familiar. Many old people are so accustomed to the idea of death, that the nearer they approach it, the less they regard it; others, from losing their faculties, and the enjoyments of their old companions, become completely tired of life, whereas, the great bulk of mankind turn their back upon death, and occupy their minds wholly with present and past events. However, all ought to meet death courageously like Christians, by duly appretiating its value; for which purpose the precepts of religion and a life of virtue are the surest means of prophylactic; but the exercise of the rational principle alone, ought to be sufficient to reconcile the mind to our inevitable fate.

We should recollect at this period, that the tenor of existence depends upon the certainty of death, and that few of the human species live so long as ourselves. A thousand millions of inhabitants are extinguished three times every century;

and three thousand four hundred persons are dying every hour of the day on the face of the earth. To suppose that the benevolent Author of our existence, who has conducted us through a long and dangerous warfare, will withdraw his protection from us, in our last and most trying moments, is an unworthy and improper sentiment respecting Divinity. We are mistaken, if we suppose the pain of death to be greater than many of our former sufferings. The struggles which appear horrible to surrounding friends, are not worse than those of epileptic patients, of which they are totally unconscious, and do not upon their recovery, know what has happened to them. The involuntary convulsions of antagonist muscles depend upon the remaining irritable power, which survives all sense of feeling and consciousness, and many persons recovered by the Humane Society have declared, they recollected no severe sufferings from submersion. In many instances of great debility from diseases, and from old age, death comes on like a kindly sleep, and when it suddenly attacks the strong states of the vital powers, the mind suffers little, in consequence of the deprivation of corporeal sensibilty.

A patient of the Author's, a gay and fashionable lady not much short of seventy, got cold at a rout in

London, which induced a simple cattarrhal fever; but when her head began next day to swim, she frequently started up in bed, exclaiming, "that she was dying, where was she going? Would no person take her fortune to save her life a few months longer?" Her perturbation of mind lasted only a short time, for in a few hours it brought on convulsions, and perfect insensibility, of which she died in less than two days. Exhilarating emotions of mind likewise assume complete dominion over the sensations of the body, as well as the depressing passion of fear. A soldier feels little pain from his wounds, while in the heat of battle; and the consideration, that the soul is not destroyed with the body, but changed to a better state, gives a good man complete victory over death.

THE END.

J. G. Barnard, Printer, 57, Skinner Street, London

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